










**Northern shortfin squid in Subareas 3+4****Advice in September 2019 for 2020 - 2022****TAC recommendation for 2020 – 2022**

The primary biomass index (Div. 4VWX) and mean body size value for 2018 were not available for use in the assessment. The 2019 values indicated that the stock may be moving towards a high productivity period. SC advice is a TAC of no more than 34 000 tons/yr.

**Management objectives**

No explicit management plan or management objectives have been defined by the Commission. Convention General Principles are applied.

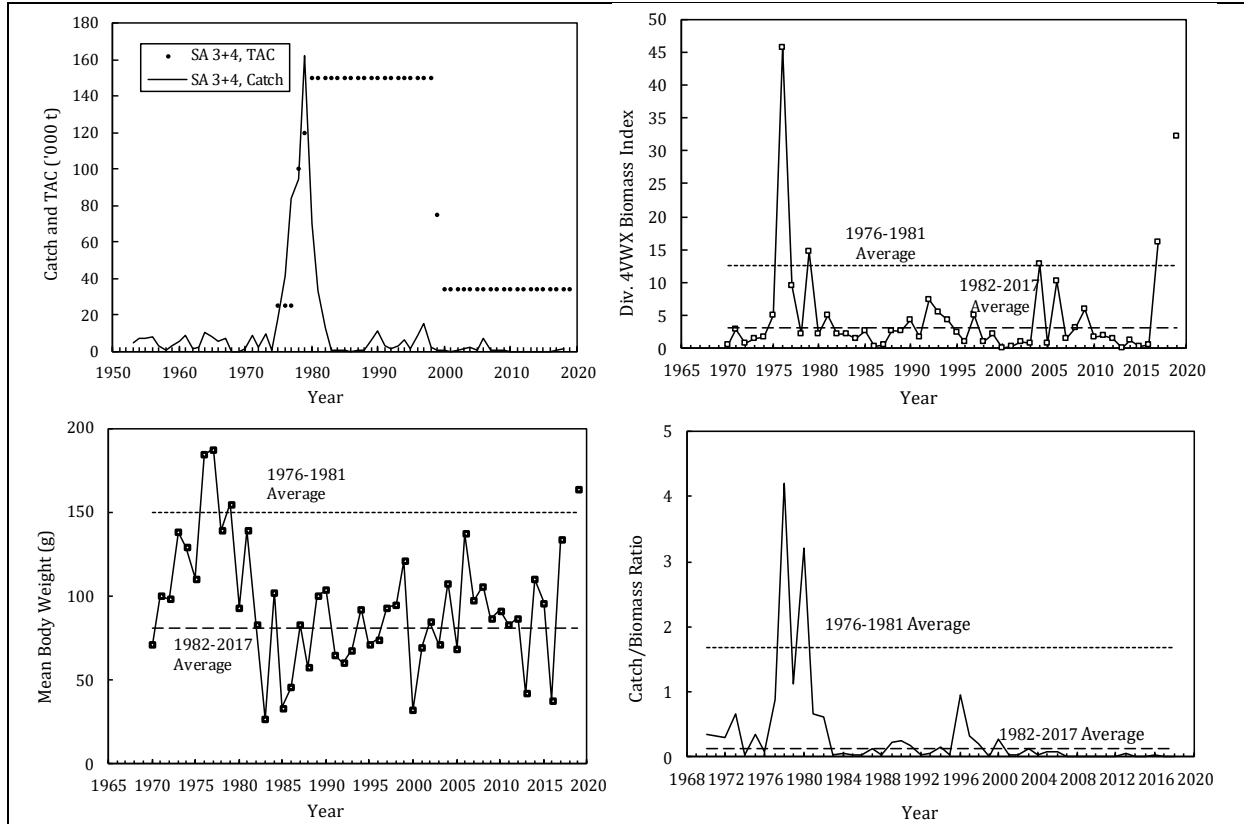
<i>Convention General Principles</i>	<i>Status</i>	<i>Comment/consideration</i>	
Restore to or maintain at $B_{msy}$		$B_{msy}$ inappropriate given life history	 OK
Eliminate overfishing		Not quantifiable	 Intermediate
Apply Precautionary Approach		Reference points based on productivity level	 Not accomplished
Minimize harmful impacts on living marine resources and ecosystems		VME closures in effect, no bycatch in SA 3 jig fishery, no SA 4 directed trawl fishery since 1999	 Unknown
Preserve marine biological biodiversity		Cannot be evaluated	

**Management unit**

The species is assumed to constitute a single stock throughout its range in the Northwest Atlantic Ocean, from Newfoundland to Florida, including Subareas 2-6, but is managed separately as northern (Subareas 3+4, by NAFO and by Canada and France (in respect of St. Pierre and Miquelon) within their respective EEZs) and southern stock components (Subareas 5+6, by USA within its EEZ). However, fishery removals in relation to the biomass levels of each stock component affect one another.

**Stock status**

Trends in fishery and research vessel survey data indicate that a period of high productivity (1976-1981) occurred in Subareas 3+4 between two low productivity periods (1970-1975 and 1982-2017). During 2018, the Div. 4VWX survey was not completed. However, the Div. 4VWX biomass index and mean body size during 2019 indicate that the stock may be moving towards a high productivity period.



### Reference points

Conventional reference points are inappropriate for squid stocks because of their unique life history. Two reference states, termed “high productivity” or “low productivity” states are defined by trends in the Div. 4VWX biomass indices and mean body weight. Low productivity periods have an estimated potential annual yield of 19 000 t to 34 000 t. The potential yields of a high productivity state have not been determined.

### Projections

Projections were not possible because, like most squid stocks, recruitment is highly variable and cannot currently be predicted.

### Assessment

Data used for the assessment were from the Division 4VWX July bottom trawl surveys and the catches in Subareas 3+4 (STACFIS Report 2019). The 2019 assessment consisted of a comparison of average survey biomass indices and mean body weights, during high (1976 – 1981) and low (1982 – 2017) productivity periods, with the values of these indices during 1970-2019. The Div. 4VWX survey was not completed in 2018, so the biomass index and mean body weight were not computed. Fishing mortality indices (catch in SA 3+4/Div. 4VWX biomass index) were used to assess exploitation. Uncertainty in the assessment is high because of the species’ sub-annual lifespan and the fact that recruitment, occurrence of the species in the survey area, and growth rates are all highly variable and greatly influenced by oceanographic conditions.

The next assessment is scheduled for 2022. Due to the short life-span of this species (less than one year), it is recommended that, if possible, future assessments occur after the summer surveys in order to incorporate data from the current year.

### Human impacts

Fishery related mortality in SA 3+4 has been very low since 2006 and primarily from the Canadian inshore jig fishery in SA 3. Other sources (e.g. pollution, shipping, oil-industry) are undocumented.

### *Biology and Environmental Interactions*

Recruitment for this species is highly variable, and the species is semelparous (spawns once during its lifetime then dies). A sufficient number of spawners must survive the fishery (spawner escapement) each year in order to ensure a high probability of successful recruitment during the subsequent year, to reduce the risk of stock collapse. Although environmental factors play a role in the recruitment process, such factors cannot be controlled or predicted. Ideally, fishing intensity should be such that spawner escapement is set at some target level which is above a minimum spawning stock biomass ( $SSB_{min}$ ) threshold. Without the ability to estimate stock size in real-time during the fishing season, as well as before and after the fishing season, the TAC should be set at a conservative level in order to avoid recruitment overfishing.

Ocean climate effects have a strong influence on the distribution, growth rates, and recruitment of Northern shortfin squid. For example, variation in the latitudinal position of the Shelf Slope Front is related to efficiency of downstream dispersal by the Gulf Stream and increased survival of young stages.

This species is both an important prey and predator in the ecosystem. The natural mortality of this prey species, which is consumed by a wide range of cetacean, pinniped, avian, invertebrate, and finfish predators, is very high. Small Northern shortfin squid prey primarily upon crustaceans and larger squid prey primarily upon finfish, and during the fall, on smaller shortfin squid.

### **Fisheries**

Prior to the mid-1980s, international bottom trawl and midwater trawl fleets participated in directed fisheries in Subareas 3, 4 and 5+6. Since 1999, there has been no directed fishery in Subarea 4, but some squid is taken as bycatch in the Canadian small-mesh bottom trawl fishery for silver hake. Directed fisheries currently consist of a Canadian inshore jig fishery in Subarea 3 and a small-mesh bottom trawl fishery in Subareas 5+6. In 2018, at least one vessel conducted a directed trawl fishery in 30. There is no bycatch in the jig fishery. There are separate management regulations applied by NAFO, USA and Canada. Recent catch estimates and TACs ('000 t) are as follows:

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
TAC SA 3+4	34	34	34	34	34	34	34	34	34	34
STATLANT21 SA 3+4	0.1	0.2	<0.1	2.7	0.1	<0.1	<0.1	0.4	1.2	
STACFIS SA 3+4	0.1 <sup>1</sup>	0.1 <sup>1</sup>	<0.1 <sup>1</sup>	<0.1 <sup>1</sup>	<0.1 <sup>1</sup>	<0.1 <sup>1</sup>	0.1	0.4	1.4	

<sup>1</sup> Includes amounts, ranging from 0.001-18 t, reported as Unspecified Squid from Subarea 4.

### **Effects of the fishery on the ecosystem**

The effects of the directed fisheries on the ecosystem are unknown, but are generally limited to June through November (depending on fishery Subarea) as a result of the species' migration patterns on and off the continental shelves. There has not been a directed fishery in Subarea 4 since 1999 and the catches from the SA 3 inshore jig fishery, the main source of catches in SA 3+4, have been low since 2007.

### **Special comments**

The assessment of this stock component may not reflect stock conditions during the three years for which management advice is given because the species has a sub-annual lifespan and the most recent year of data used in the assessment is normally for two years prior.

There are no TACs set by France (in respect of St. Pierre et Miquelon) or Canada for jig fisheries within their respective EEZs. The latter comprises the majority of the catch since 1999.

### **Sources of information**

SCR Doc. 98/59,75; 99/66; 06/45; 16/34; 19/42