Fisheries and Oceans Canada | Pêches et Océans Canada
Ecosystems and Oceans Science | Sciences des écosystèmes et des océans

Canadian Science Advisory Secretariat
Newfoundland and Labrador Region | Science Advisory Report 2018/005

ASSESSMENT OF WHITE HAKE *(UROPHYCIS TENUIS)* IN NAFO SUBDIVISION 3PS

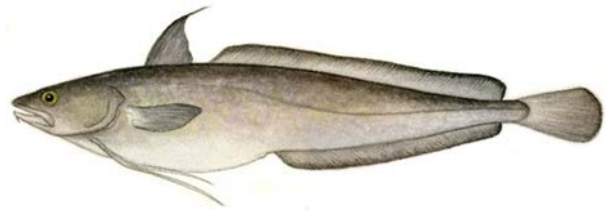


Image: White Hake (Urophycis tenuis).

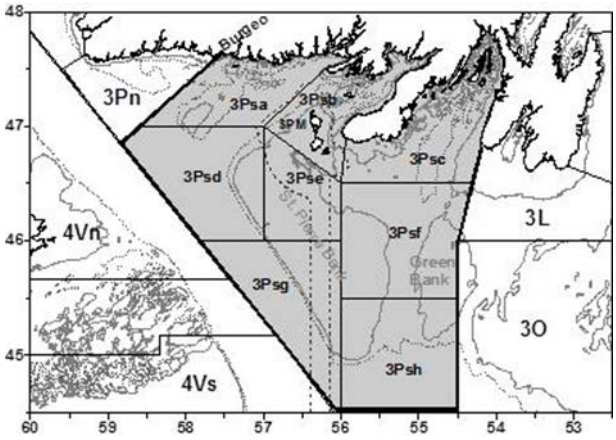


Figure 1. Subdivision 3Ps management area (shaded), unit areas (thin solid lines), and exclusive economic zone around the French islands of St. Pierre and Miquelon (SPM; dashed lines).

Context:

White Hake in Northwest Atlantic Fisheries Organization (NAFO) Subdivision (Subdiv.) 3Ps was last assessed in 2015 (DFO 2016). The present Subdiv. 3Ps assessment was requested by the Department of Fisheries and Oceans Canada (DFO) Fisheries Management Branch (Newfoundland and Labrador [NL] Region), to inform the development of management measures for the stock.

This Science Advisory Report is from the November 1, 2017 Subdiv. 3Ps White Hake Assessment. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SUMMARY

- White Hakes in Subdivision 3Ps and Division 3NO constitute a single biological stock, which has been assessed by the Northwest Atlantic Fisheries Organization's (NAFO) Scientific Council every two years since 2005.
- NAFO-reported landings for Canada were variable over 2000-08 in Subdiv. 3Ps, but remained relatively high: averaging 1,219 t. Since 2009, Canadian average landings have been below 400 t.
- Abundance index for Subdiv. 3Ps from the DFO-NL spring surveys ranged from 4.0 to 15.1 million White Hakes, and biomass index ranged from 2,582 t to 10,294 t over 1996-2016. The average abundance index from 1996-2016 was 7.6 million, and the average biomass

index was 5,737 t. In 2017, the abundance index was 7.1 million, and the biomass index was 4,848 t.

- Distributions of White Hake over 2008-17 were consistent with historic data from DFO-NL spring surveys; indicating that White Hakes in Div. 3P were found mostly in the Laurentian, Hermitage, and Halibut Channels.
- Large episodic recruitment of Divs. 3NOPs White Hake was observed in 2000. Recruitment remained at much lower levels since 2001. In 2017, this Divs. 3NOPs index increased, but was still very small in comparison to the last large recruitment peak.
- The relative fishing mortality index for Subdiv. 3Ps has remained below its 1996-2016 average since 2010.
- White Hake biomass and abundance indices for Subdiv. 3Ps increased over the past two years, and recent Canadian average landings below 400 t in this Subdivision did not seem to negatively impact the Div. 3P portion of the Divs. 3NOPs stock.
- Ecosystem signals observed in Subdiv. 3Ps in recent years indicated that structural changes are occurring, and overall ecosystem productivity may be low. Although the direct impacts of these changes on White Hake life stages (i.e., pelagic eggs and larvae, bottom-dwelling juveniles and adults) are unknown, they imply that at least some aspects of White Hake productivity may be affected.
- White Hake in Subdiv. 3Ps is part of the Divs. 3NOPs stock. Difficulties in applying the Limit Reference Point (LRP) concepts to White Hake include its episodic recruitment, and other data limitations. LRP options were not accepted for this species.

INTRODUCTION

White Hake (*Urophycis tenuis*, Mitchill 1815) is a highly fecund gadoid species distributed in the Northwest Atlantic from Cape Hatteras to southern Labrador. Current knowledge of White Hake biology for the Grand Banks and southern Newfoundland waters has been summarized in previous assessments (Kulka et al. 2005; Han and Kulka 2007; Kulka and Miri 2007; Simpson et al. 2012; Simpson et al. 2016; Simpson and Miri 2017).

White Hakes in NAFO Subdivision 3Ps and Divisions 3NO constitute one biological stock, which has been assessed by the Northwest Atlantic Fisheries Organization's (NAFO) Scientific Council every two years since 2005. To respond to the Department of Fisheries and Oceans (DFO) Fisheries Management Branch's (Newfoundland and Labrador [NL] Region) request for advice, White Hake in Subdiv. 3Ps was assessed separately by DFO-NL Science Branch. However, using this Subdivision-based assessment approach for White Hake can create several issues : Subdiv. 3Ps abundance and biomass indices are not population indicators for this species, but rather only represent White Hakes in this small region; the majority of recruitment for this species originates in Divs. 3NO, with pelagic larvae settling on the southern part of the Grand Bank, then dispersing into all stock areas (including Div. 3P); the drastic decline in White Hake abundance and biomass following its large recruitment event of 1999-2000 was due to fishing in Divs. 3NO (mainly outside Canada's 200-mile limit); and establishment of Limit Reference Points (LRPs) is precluded by any analytical investigations that exclude Divs. 3NO data.

This paper updates the previous assessment of White Hake in Subdiv. 3Ps (Fig. 1), using commercial fisheries and DFO-NL research survey data, with additional information from Subdiv. 3Pn.

Oceanography and ecosystem Overview

Oceanographic conditions in Subdiv. 3Ps are influenced by several factors: local atmospheric climate conditions, advection by the Labrador Current from the east and warmer and saltier Gulf Stream waters from the south, and complex bottom topography in the region. The extent of bottom areas where water temperatures exceed 4°C (White Hake are “temperature seekers”, mainly found in 4-10°C) has been increasing over the past two decades, and warm slope water intrusions have elevated temperatures to near 10°C in some offshore areas in recent years.

Compared with those in 1998-2017, the spring phytoplankton bloom was observed later, of shorter duration, and reduced in magnitude during 2015-17, while zooplankton biomass was at its lowest level in this time-series.

Ecosystem signals observed in Subdiv. 3Ps in recent years indicated that structural changes are occurring, and overall ecosystem productivity may be low. Although the direct impacts of these changes on White Hake life stages (i.e., pelagic eggs and larvae, bottom-dwelling juveniles and adults) are unknown, they imply that at least some aspects of White Hake productivity may be affected.

Fisheries

The status of White Hake in Subdiv. 3Ps was first assessed in 1996 (as part of an assessment of the entire Divs. 3LNOP stock distribution; DFO 1996), then in 1998 (DFO 1998), 2002 (DFO 2002), and 2015 (DFO 2016). White Hake in Divs. 3NO came under NAFO’s quota regulation in September 2004. NAFO Fisheries Commission decided that a Total Allowable Catch (TAC) of 8,500 t be established for Divs. 3NO for 2005-07. Canada did not implement a TAC for Subdiv. 3Ps within its Exclusive Economic Zone (EEZ).

Commercial fisheries removals of White Hake in Subdivs. 3Ps and 3Pn were examined for 1960-2016, using three data sources: NAFO STATLANT-21A landings (1960-2016), as reported by NAFO-member countries; DFO-NL Zonal Interchange File Format (ZIFF) landings (1985-2016), as recorded in logbooks by Canadian fishers operating in Canada’s EEZ; and Canadian at-sea fisheries observers’ (ASOs) reported catch and discards (1978-2016). It must be noted that Canadian ASOs constitute the sole source of data on total catch (= landings + discards) by species at sea.

NAFO-reported landings of White Hake in Div. 3P were mainly from Subdiv. 3Ps, and largely attributed to fishing by Canadian fleets (Fig. 2). Since 1989, international landings from Subdiv. 3Ps were taken only by France (St. Pierre and Miquelon). During the 1960s, total annual landings in Subdiv. 3Ps averaged 266 t, then increased significantly in 1971 and averaged 1,608 t over 1971-78. Landings were variable throughout 1979-93, but remained relatively high (averaging 1,044 t). During 1994-2002, landings from Canadian fisheries declined to an average of 603 t. Over 2003-07, landings from Subdiv. 3Ps were variable, but remained relatively high: averaging 1,364 t (following recruitment of a large Divs. 3NOPs 1999 year-class to the fishery). Since 2009, Canadian average landings have been below 400 t.

NAFO-reported landings from Subdiv. 3Pn averaged 173 t during the 1970s, with a maximum of 295 t in 1972. Throughout the 1980s and 90s, landings averaged 88 t annually. During 2000-07, Canadian landings averaged 79 t, and then 25 t over 2008-15. Total annual landings from Subdiv. 3Pn were 148 t in 2016.

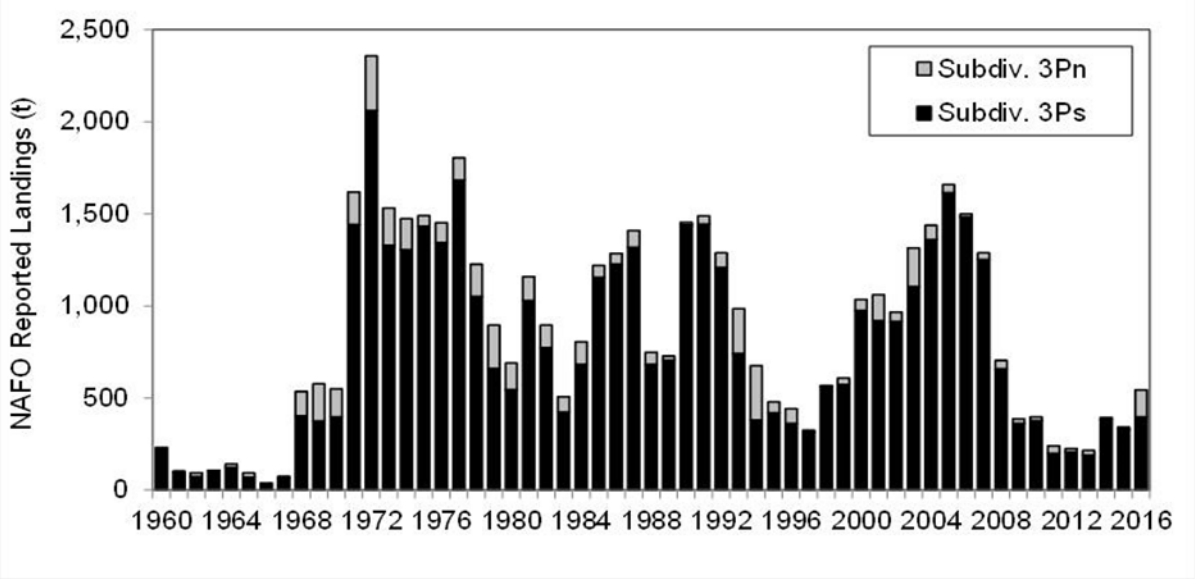


Figure 2. NAFO-reported landings (tonnes) of White Hake by Canada in Subdiv. 3Ps and 3Pn, 1960-2016 (STATLANT-21A).

ZIFF-reported annual landings of White Hake in Div. 3P also showed a majority from Subdiv. 3Ps (Fig. 3). However, most of the reported landings from Subdiv. 3Ps during the mid-1980s to early 90s should be interpreted with caution, as a portion of landings of Atlantic Cod (*Gadus morhua*) from Canadian longline fisheries during this period were misreported as White Hake. Canadian landings of White Hake from Subdiv. 3Ps averaged 952 t in 2000-08, and 243 t over 2009-14. Landings were 149 t in 2015, and 267 t in 2016. ZIFF-reported landings of White Hake from Subdiv. 3Pn averaged 76 t in 2000-08, and 24 t over 2009-14. Landings in Subdiv. 3Pn were 12 t in 2015, and 149 t in 2016.

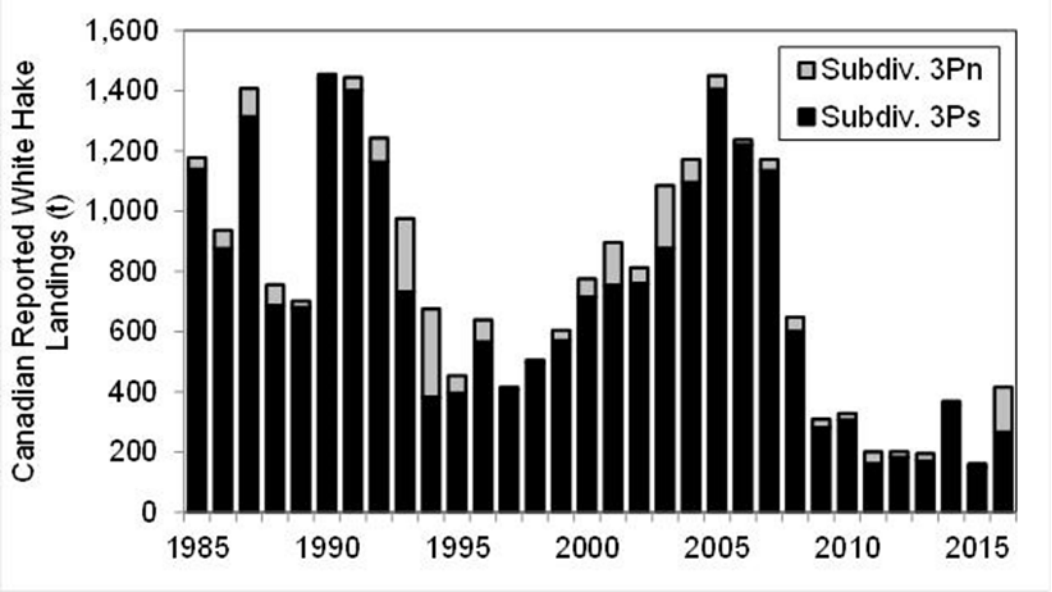
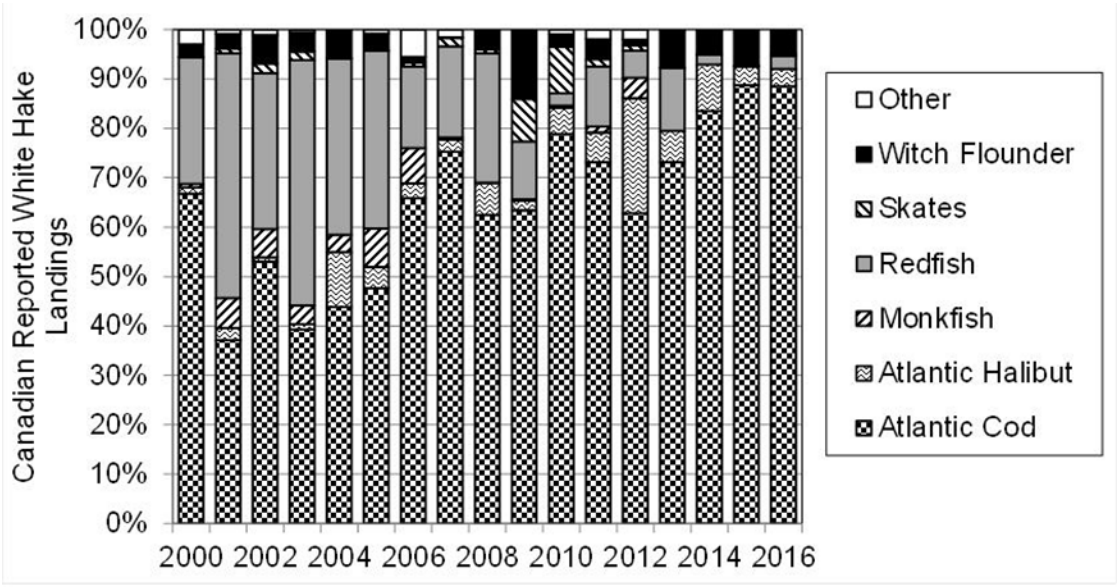


Figure 3. DFO-NL ZIFF-reported Canadian landings (tonnes) of White Hake in Subdiv. 3Ps and 3Pn, 1985-2016.

White Hakes in Subdiv. 3Ps over 2000-16 were primarily landed from gillnets, secondarily from longlines, and a small proportion from otter trawls and other gears. Landings were predominantly from Subdiv. 3Ps White Hake-directed fisheries; although bycatch in some years exceeded 50% of the landings.

Bycatch of White Hake in Subdiv. 3Ps over 2000-16 was landed mainly from gillnet fisheries targeting Atlantic Cod and redfish (*Sebastes* spp.), in addition to other species (Fig. 4). Since 2014, the Cod fishery has accounted for greater than 80% of White Hake bycatch. In White Hake-directed fisheries, bycatch of other commercially important species occurred: Atlantic Cod, Atlantic Halibut (*Hippoglossus hippoglossus*), American Plaice (*Hippoglossoides platessoides*), Haddock (*Melanogrammus aeglefinus*), and Monkfish (*Lophius americanus*). In Subdiv. 3Pn, White Hake bycatch was almost exclusively landed from longline fisheries directing for Cod and Atlantic Halibut, with over 50% taken by the latter fishery since 2011 (Fig. 4).



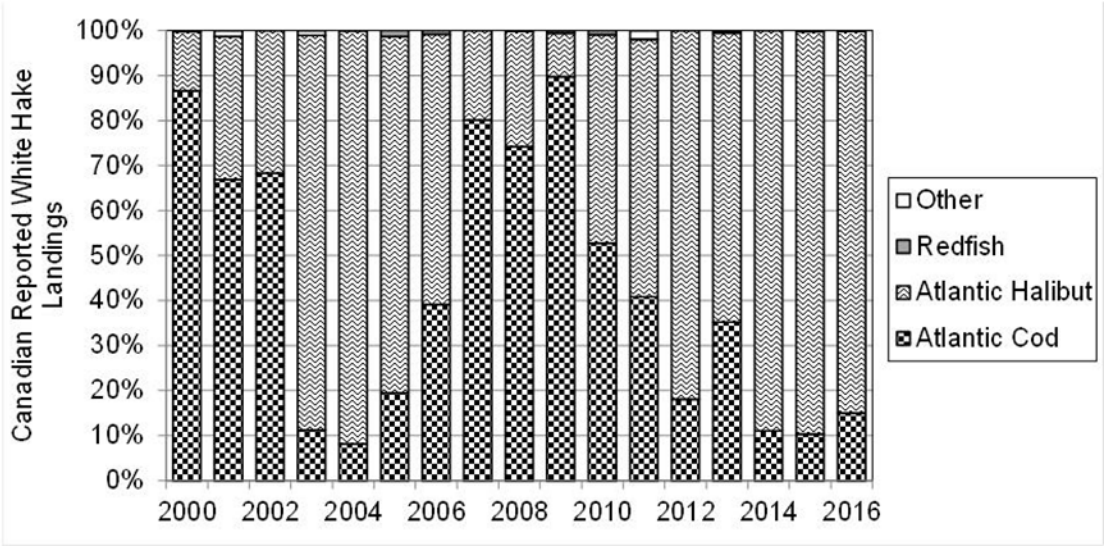


Figure 4. DFO-NL ZIFF-reported landings of White Hake bycatch by directed species in Subdiv. 3Ps (top panel) and 3Pn (bottom panel), 2000-16.

ASSESSMENT

Abundance and biomass indices from DFO-NL spring surveys indicated that the majority of Div. 3P White Hakes was consistently found in Subdiv. 3Ps. Temporal trends in these estimates were similar in both Subdivisions, despite a difference in their magnitude (Fig. 5). Abundance and biomass increased through the first half of the Yankee and Engel time-series. In Subdiv. 3Ps, abundance and biomass peaked in 1981 (4.7 million fish; 7,500 t; respectively) and 1988 (5.5 million fish; 13,000 t), then declined to the end of both time-series. In the Campelen time-series, abundance estimates ranged from 4.0 (in 2008) to 15.1 million (in 2002) White Hakes over 1996-2016; averaging 7.6 million (Fig. 5, left panels). In this period, biomass estimates ranged from 2,582 t (in 2009) to 10,294 t (in 2000); averaging 5,737 t. In 2017, the abundance index was 7.1 million, and the biomass index was 4,848 t. In Subdiv. 3Pn, abundance and biomass indices increased from a low of 0.3 million fish and 180 t (respectively) in 2003, and remained stable around 1.6 million White Hakes and 720 t in 2009-13 (Fig. 5, right panels). It must be noted that Div. 3P estimates in isolation do not represent any changes or trends in indices for the entire Divs. 3NOP White Hake stock.

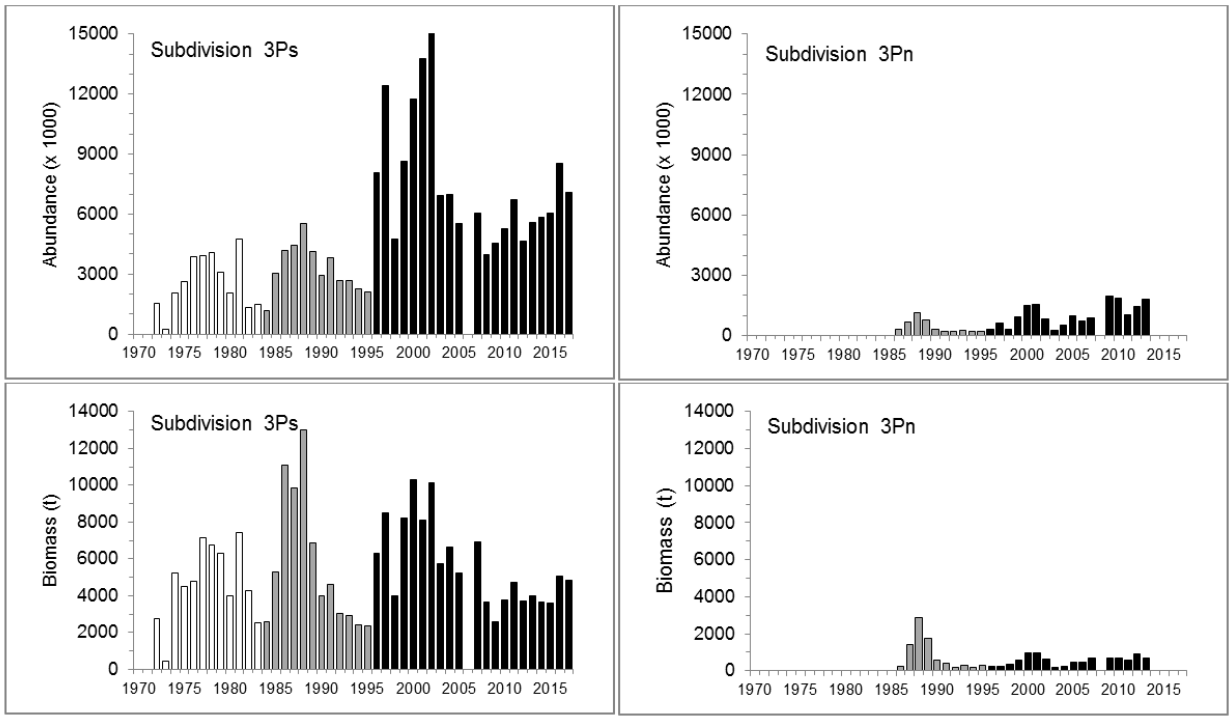


Figure 5. Annual estimates of abundance and biomass for White Hake from DFO-NL spring research surveys in Subdiv. 3Ps (left column) and Subdiv. 3Pn (right column), 1972-2017. Note that there is no conversion factor between Yankee (open columns), Engel (gray columns), and Campelen (black columns) time-series. Most of Subdiv. 3Ps was not surveyed in spring 2006 due to Canadian research vessels' mechanical difficulties, and Subdiv. 3Pn was not surveyed in 2008, 2014-17.

Catch rates in DFO-NL spring surveys of Subdiv. 3Ps increased through the mid-1970s, and then declined until the early 1980s; similar trends occurred from the 1980s until the mid-2000s, when catch rates stabilized at very low levels (Fig. 6).

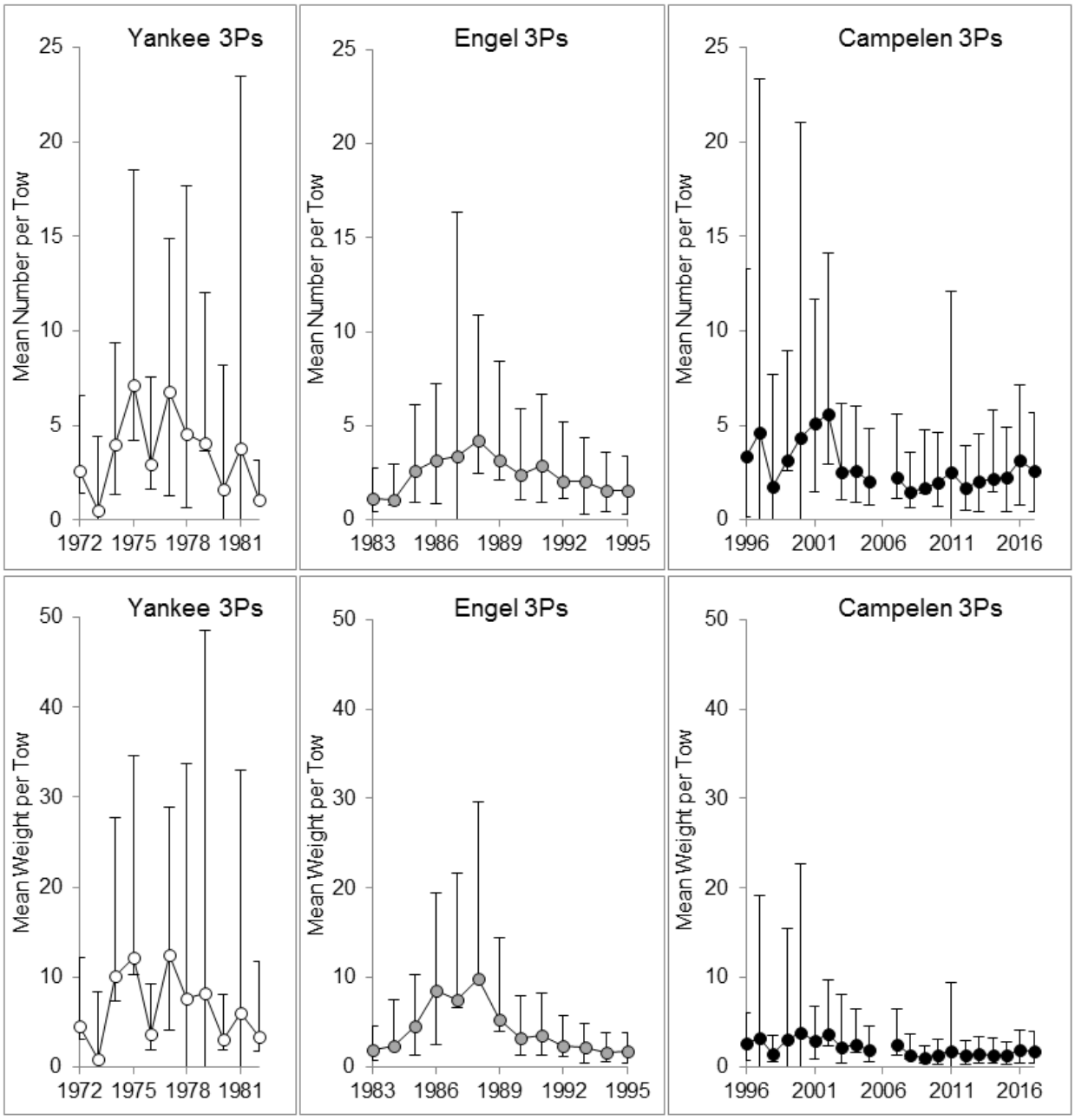


Figure 6. White Hake mean numbers (top panels) and mean weights (kg; bottom panels) per tow (+/- 95% CI) from DFO-NL spring surveys in Subdiv. 3Ps, 1972-2017. Note that there is no conversion factor between Yankee (open circles), Engel (gray circles), and Campelen (black circles) time-series. Most of Subdiv. 3Ps was not surveyed in spring 2006, due to Canadian research vessels' mechanical difficulties. Bounds of the error bars in 1973, 1978-81, 1987, 1997-2000, and 2011 in some panels extend below the graph limits.

In Subdiv. 3Pn, catch rates in DFO-NL spring surveys followed similar patterns to those in Subdiv. 3Ps: peaking in the late 1980s, and then declining over subsequent years (Fig. 7).

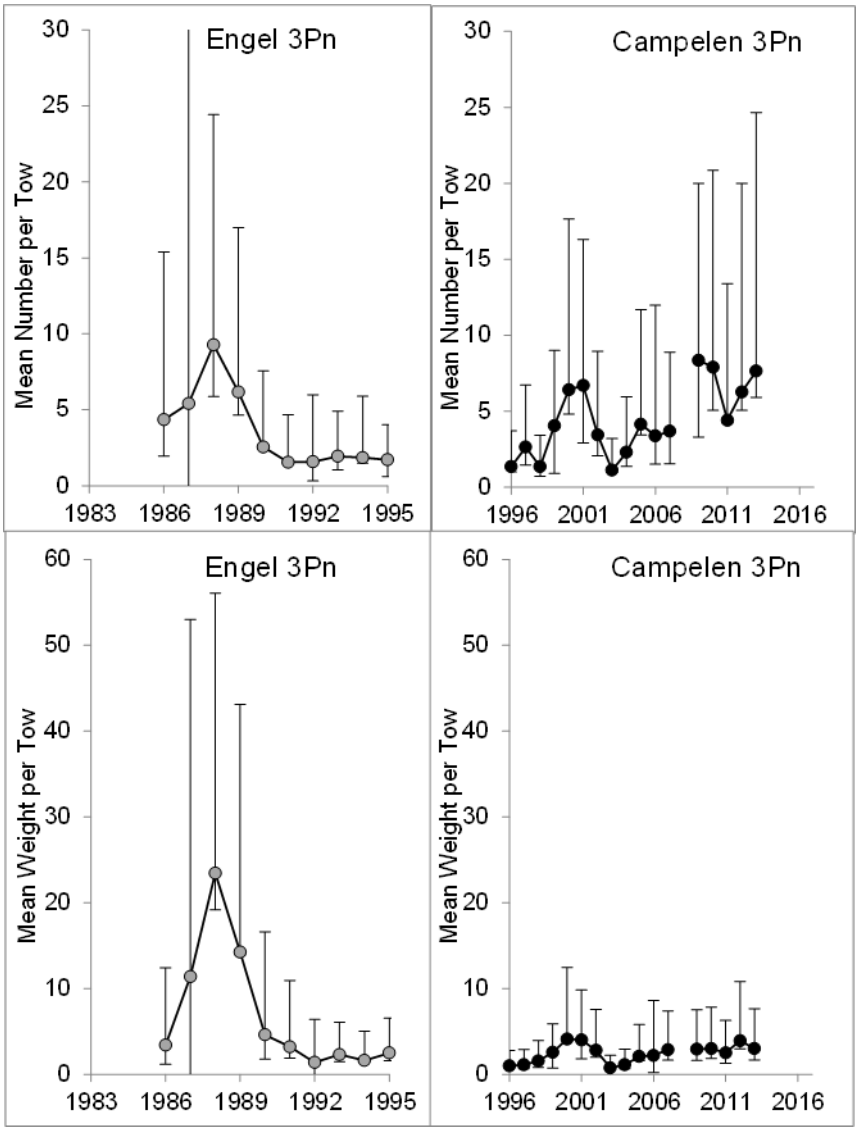


Figure 7. White Hake mean numbers (top panels) and mean weights (kg; bottom panels) per tow (+/- 95% CI) from DFO-NL spring surveys in Subdiv. 3Pn, 1986-2013. Note that there is no conversion factor between Engel (gray circles) and Campelen (black circles) time-series. Subdiv. 3Pn was not surveyed in 2008, 2014-17. Bounds of the error bars in 1987 and 1992 in some panels extend below the graph limits.

Geo-referenced mean numbers per tow from DFO-NL Campelen spring surveys were used to assess the spatial distribution of White Hakes in Div. 3P. Distributions of White Hake over 2013-17 were consistent with historic data; indicating that White Hakes in Div. 3P were found mostly in the Laurentian, Hermitage, and Halibut Channels (Fig. 8).

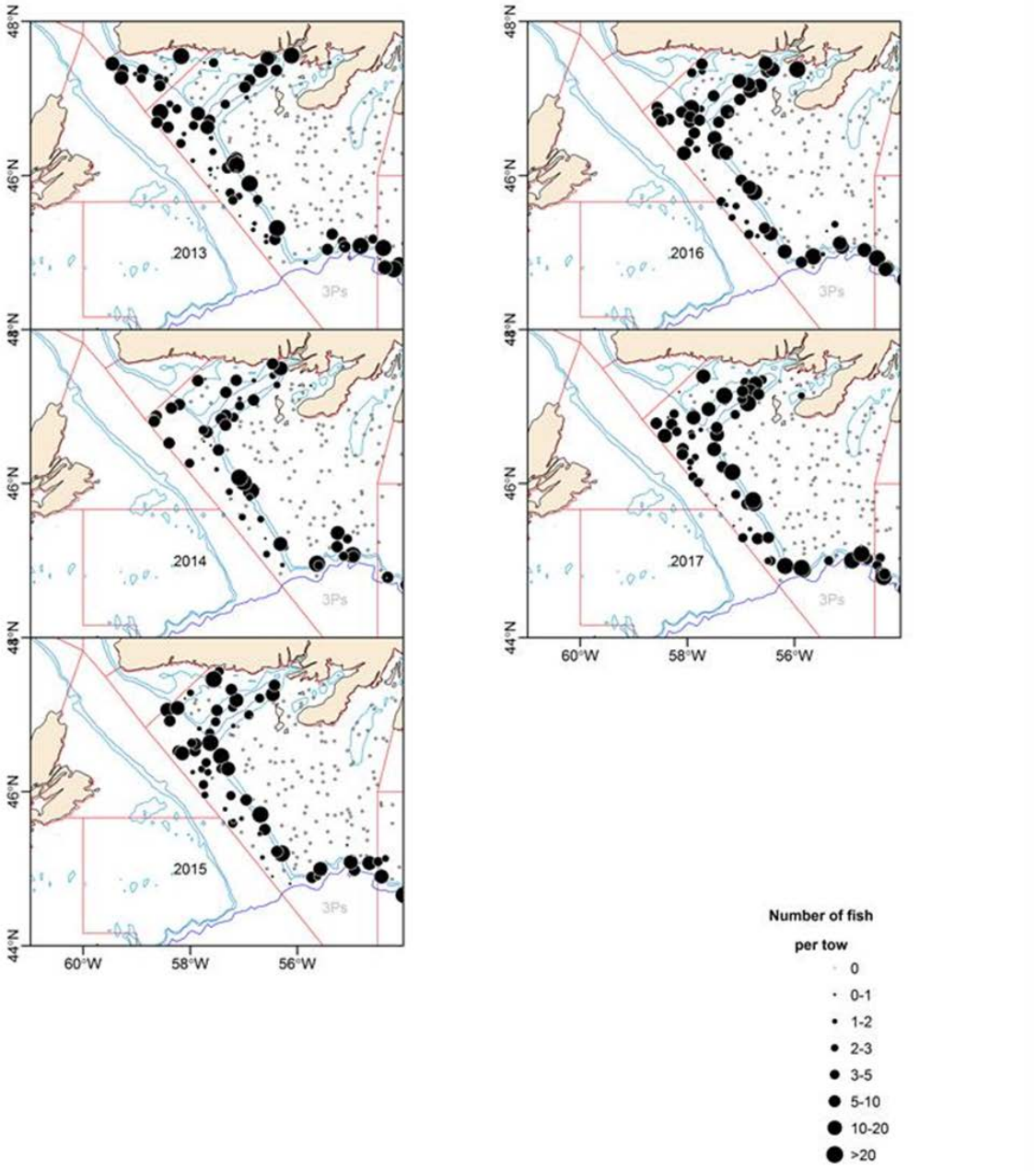


Figure 8. Distribution of White Hake mean numbers per tow in Div. 3P, based on DFO-NL spring surveys in 2013-17. Note that Subdiv. 3Pn was not surveyed in 2014-17.

In DFO-NL spring surveys of Divs. 3NOPs, the number of White Hakes ≤26 cm in length is assumed to be an index of recruitment at Age 1. Originating in Divs. 3NO, large episodic recruitment of White Hake was observed in 2000, with pelagic larvae settling on the southern part of the Grand Bank, then dispersing into all stock areas (including Div. 3P; Fig. 9).

Recruitment of White Hake remained at much lower levels since 2001. In 2017, this index increased, but was still very small in comparison to the last large recruitment peak.

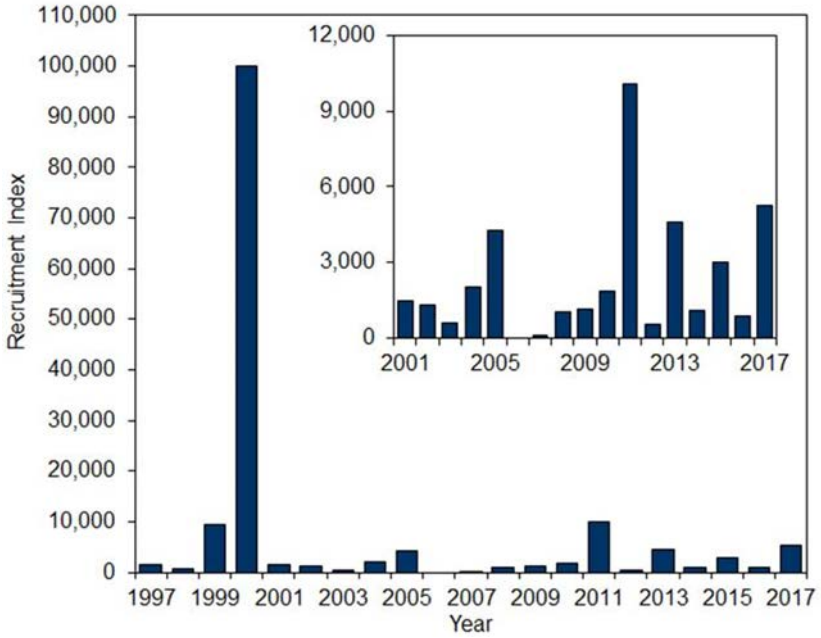


Figure 9. White Hake recruitment index for Age 1 males and females (combined) from DFO-NL Campelen spring surveys in Divs. 3NO and Subdiv. 3Ps, 1997-2017. Inset plot depicts 2001-17 on a smaller scale. Estimates from 2006 are not shown, since survey coverage in that year was incomplete.

Estimates of relative fishing mortality (Relative F = NAFO-reported landings/DFO-NL spring survey biomass index) were calculated for White Hake in Subdiv. 3Ps. The Relative F index increased to a high peak in 2003-05, due to the large Divs. 3NOPs 1999 year-class (Fig. 10). This index remained below its 1996-2016 average of 0.12 since 2010.

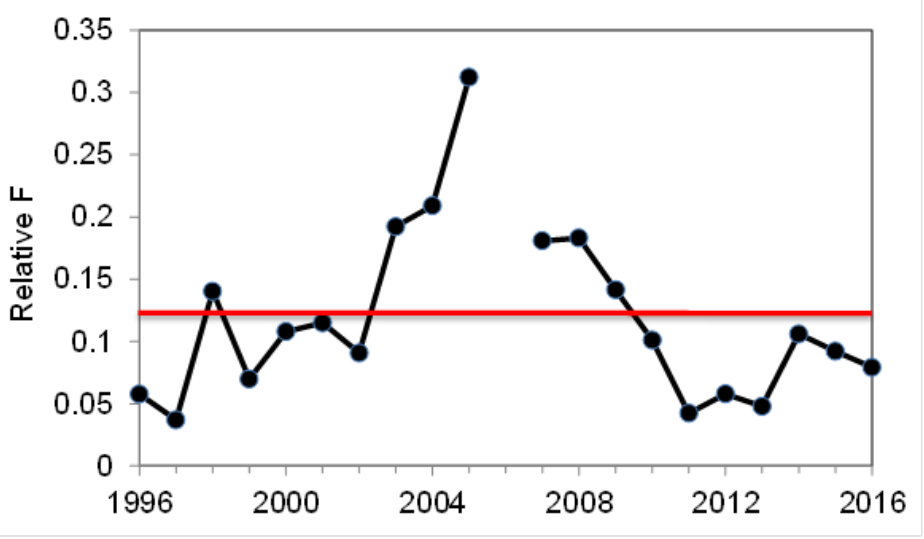


Figure 10. Relative F index (=NAFO-reported commercial landings/DFO-NL Campelen spring survey biomass) for White Hake in Subdiv. 3Ps, 1996-2016. Thick horizontal line depicts the average over these years. Note that most of Subdiv. 3Ps was not surveyed in 2006, due to Canadian research vessels' mechanical difficulties.

Sources of Uncertainty

- Although White Hakes in Subdiv. 3Ps and Divs. 3NO constitute one biological stock, DFO Fisheries Management requested advice from DFO-NL Science for White Hake in Subdiv. 3Ps only. Using this Subdivision-based assessment approach for White Hake can create several issues: Subdiv. 3Ps abundance and biomass indices are not population indicators for this species, but rather only represent White Hakes in this small region; the majority of recruitment for this species originates in Divs. 3NO, with pelagic larvae settling on the southern part of the Grand Bank, then dispersing into all stock areas (including Div. 3P); the drastic decline in White Hake abundance and biomass following its large recruitment event (primarily in Divs. 3NO) of 1999-2000 was due to fishing in Divs. 3NO (mainly outside Canada's 200-mile limit); and establishment of Limit Reference Points (LRPs) is precluded by any analytical investigations that exclude Divs. 3NO data.
- Discarding at sea of White Hake bycatch remains unreported or very poorly reported in Canadian and other fisheries. Canadian at-sea fisheries observers constitute the sole source of data on total catch (= landings + discards) by species at sea. However, there is very low at-sea observer coverage in most Canadian Atlantic fisheries; thereby underestimating fishery impacts on this stock, and preventing at-sea collections of important biological data on White Hake (length, weight, sex, maturity, otoliths).
- White Hake age data are not available from DFO-NL research surveys. In addition, data on length, weight, and maturity of White Hakes in DFO-NL survey catches are incomplete.
- Originating in Divs. 3NO, recruitment of Divs. 3NOPs White Hake remains unpredictable, and has been extremely low since the one generated by its large 1999 year-class.
- Ecosystem signals observed in Subdiv. 3Ps in recent years indicated that structural changes are occurring, and overall ecosystem productivity may be low. Although the direct impacts of these changes on White Hake life stages (i.e., pelagic eggs and larvae, bottom-dwelling juveniles and adults) are unknown, they imply that at least some aspects of White Hake productivity may be affected.
- Impacts of anthropogenic activities (e.g., marine plastics pollution, seismic surveys, oil and gas drilling, oil pollution) and climate change (i.e., increasing ocean temperatures, decreasing salinities, decreasing marine dissolved oxygen) on White Hake life stages and their habitats remain unknown.
- Limit reference points for White Hake in Div. 3P have not been defined. Previous investigations of limit reference points for this species were conducted for its Divs. 3NOPs stock (Simpson et al. 2015, 2016) using a Bayesian surplus production model, Catch-resilience models, and empirical methods based on DFO-NL survey biomass indices. During its June 2015 Meeting (and reiterated in June 2017), NAFO Scientific Council concluded that none of these assessment models were acceptable in capturing the episodic character of this White Hake population and, therefore, proposed limit reference points were not adopted (Simpson et al. 2015). Since limit reference points have not yet been accepted for the Divs. 3NOPs stock, it is inappropriate to establish them for Subdiv. 3Ps (or any subcomponent of the population).

CONCLUSIONS AND ADVICE

White Hake biomass and abundance indices for Subdiv. 3Ps increased over the past two years, and Canadian average landings below 400 t in this Subdivision over 2009-16 did not seem to negatively impact the Div. 3P portion of the Divs. 3NOPs stock. It must be noted that, without a

recruitment event such as that seen for Divs. 3NOPs White Hake in 1999-2000 (thereby supporting high landings over 2003-07), higher catches are not sustainable. In addition, if increased landings result from the increasing commercial interest in harvesting White Hake due to declining stocks of other groundfish and shellfish in this area, inhibitive pressures on White Hake in Div. 3P may be further exacerbated.

Age-structured assessment of the Divs. 3NOPs stock is currently not feasible. However, population abundance-at-length estimates from DFO-NL spring surveys suggest that no large recruitment has occurred for Divs. 3NOPs White Hake over the past sixteen years.

Given that good recruitment has rarely occurred and remains unpredictable for the Divs. 3NOPs White Hake stock, commercial fishing pressure should be regulated in Subdiv. 3Ps by a TAC set at a level that will allow survival and growth to maturity of larger year-classes. This strategy (coupled with enforcement) is crucial to rebuilding the Div. 3P portion of the stock; especially given that the drastic declines in Divs. 3NOPs White Hake abundance and biomass following its large recruitment event of 1999-2000 was due to fishing in Divs. 3NO (mainly outside Canada's EEZ; Kulka and Miri 2007).

In the absence of a TAC, regulations that limit the amount of White Hake bycatch for other directed fisheries in Canada's EEZ could also be implemented.

Given that Canadian at-sea fisheries observers constitute the sole source of data on total catch (= landings + discards) by species at sea, annual observer coverage of Canadian White Hake-directed and bycatch fisheries should be increased to significantly improve the reliability and representativeness of estimates of total removals of this species due to fishing, and allow at-sea collections of important biological data on White Hake (length, weight, sex, maturity, otoliths).

A six-year assessment schedule is recommended for Subdiv. 3Ps White Hake. This subcomponent is included in the biennial Divs. 3NOPs White Hake stock assessments (with interim monitoring reports in non-assessment years) conducted by NAFO Scientific Council. Furthermore, a full assessment should be triggered if the major population indicator for this species (i.e., the DFO spring survey Divs. 3NOPs biomass index) statistically changes by more than two standard deviations, as reviewed by NAFO Scientific Council. This re-assessment may result in revised landings advice to DFO Fisheries Management for White Hake-directed and bycatch fisheries in Div. 3P.

SOURCES OF INFORMATION

This Science Advisory Report is from the November 1, 2017 Subdiv. 3Ps White Hake Stock Assessment. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

DFO. 1996. White hake in Divisions 3L, 3N, 30 and 3Ps. DFO Stock Status Report 96/90E.

DFO. 1998. White hake in Divisions 3L, 3N, 30 and 3Ps. DFO Stock Status Report A2-06 (1998).

DFO. 2002. White hake in Divisions 3L, 3N, 30 and 3Ps. DFO Sci. Stock Status Report A2-06 (2002).

DFO. 2016. Stock Assessment of NAFO Subdivision 3Ps White Hake (*Urophycis tenuis*). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2016/009.

Han, G., and Kulka, D.W. 2007. Dispersion of eggs, larvae and pelagic juveniles of white hake (*Urophycis tenuis*, Mitchill 1815) on the Grand Banks of Newfoundland in relation to subsurface currents. NAFO Sci. Coun. Res. Doc. 07/021. 27p.

Kulka, D.W., and Miri, C.M. 2007. The status of White Hake (*Urophycis tenuis*, Mitchill 1815) in NAFO Divisions 3N, 3O, and Subdivision 3Ps. NAFO Sci. Coun. Res. Doc. 07/052. 52p.

Kulka, D.W., Miri, C.M., and Simpson, M.R. 2005. Distribution and aspects of the life history of White Hake (*Urophycis tenuis*, Mitchill 1815) on the Grand Banks of Newfoundland. NAFO Sci. Coun. Res. Doc. 05/60. 40p.

Martell, S., and Froese, R. 2013. A simple method for estimating MSY from catch and resilience. Fish and Fisheries 14(4): 504-514. 11p.

Simpson, M.R., and Miri, C.M. 2017. An assessment of White Hake (*Urophycis tenuis*, Mitchill 1815) in NAFO Divisions 3N, 3O, and Subdivision 3Ps. NAFO Sci. Coun. Res. Doc. 17/033. 32p.

Simpson, M.R., Miri, C.M., and Mello, L.G.S. 2012. A pre-COSEWIC assessment of White Hake (*Urophycis tenuis*) in Newfoundland and Labrador waters. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/038. ii + 59p.

Simpson, M.R., Bailey, J.A., Collins, R.K., Miri, C.M., and Mello, L.G.S. 2015. Limit reference points for Div. 3LNO Thorny Skate (*Amblyraja radiata*) and Div. 3NOPs White Hake (*Urophycis tenuis*).NAFO Sci. Coun. Res. Doc. 15/040. 26p.

Simpson, M.R., Collins, R.K., Miri, C.M., and Bailey, J.A. 2016. Evaluation of White Hake (*Urophycis tenuis*) populations in the NL Region in support of a Recovery Potential Assessment. DFO Can. Sci. Advis. Sec. Res. Doc. 2016/051. iv + 57p.

THIS REPORT IS AVAILABLE FROM THE :

Centre for Science Advice (CSA)
Newfoundland and Labrador Region
Fisheries and Oceans Canada
PO BOX 5667
St. John's NL A1C 5X1

Telephone: (709-772-3332)
E-Mail: DFONLCentreforScienceAdvice@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs/

ISSN 1919-5087

Correct Citation for this Publication:

DFO. 2018. Assessment of White Hake (*Urophycis tenuis*) in NAFO Subdivision 3Ps. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2018/005.

Aussi disponible en français :

MPO. 2018. Évaluation de la merluche blanche (Urophycis tenuis) dans la sous-division 3PS de l'OPANO. Secr. can. de consult. sci. du MPO, Avis sci. 2018/005.