

# STARRY RAY – TINDASKATA

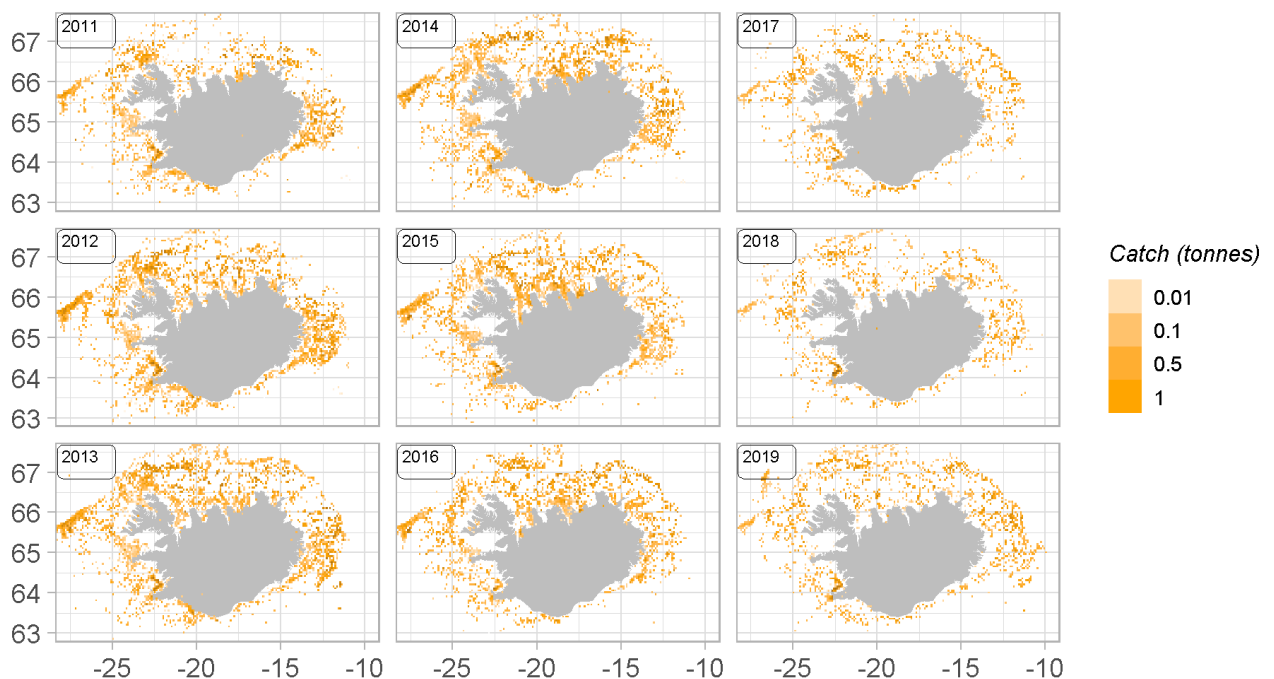
## *Amblyraja radiata*

### GENERAL INFORMATION

Starry ray is by far the most abundant elasmobranch species in Icelandic waters. It has a widespread distribution over the Icelandic shelf and upper slope at depths from 20 to 1000 m but is most common at 30–200 m. In Icelandic surveys the starry ray is rarely caught larger than 70 cm but most commonly at 30–50 cm. Reproduction is believed to occur to some extent throughout the year, however mainly during summer.

### THE FISHERY

Starry ray is abundant in Icelandic waters and is a common bycatch in variety of fishing gears. Catches of starry ray are taken all around Iceland but mostly within Faxaflói in the southwest (Figure 1). The increased landings since the 1990s are partly related to an increased retention, compensating for a lower abundance of the *D. batis* complex. However, fishing regulations are likely responsible for the high proportion of landings from Danish seine in the nineties (Figure 2). In the last decade landings are mainly reported from the longline fishery (Figure 2). Reported landings increased from 500 tonnes in 2007 to more than 1700 tonnes in 2012. Thereafter, landings declined and in 2017 and 2018 they did not exceed 700 tonnes. A large proportion of the landings is for local consumption linked to the yule season. This is reflected in the strong seasonality in landings; most landings are reported from September–November each year (Figure 3).



**Figure 1. Starry ray. Geographical distribution of the Icelandic fishery since 2011.**

*Mynd 1. Tindaskata. Útbreiðsla veiða á Íslandsmiðum frá 2011.*

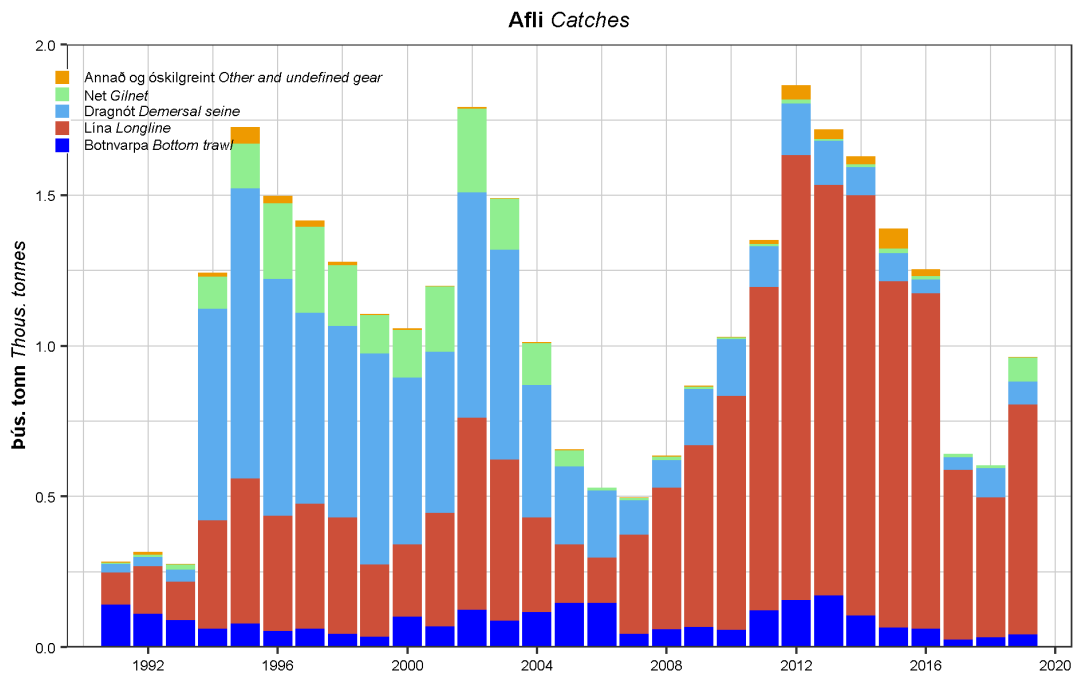


Figure 2. Starry ray. Landings by fishing gear since 1991.

Mynd 2. Tindaskata. Landanir skipt eftir veiðarfærum frá 1991.

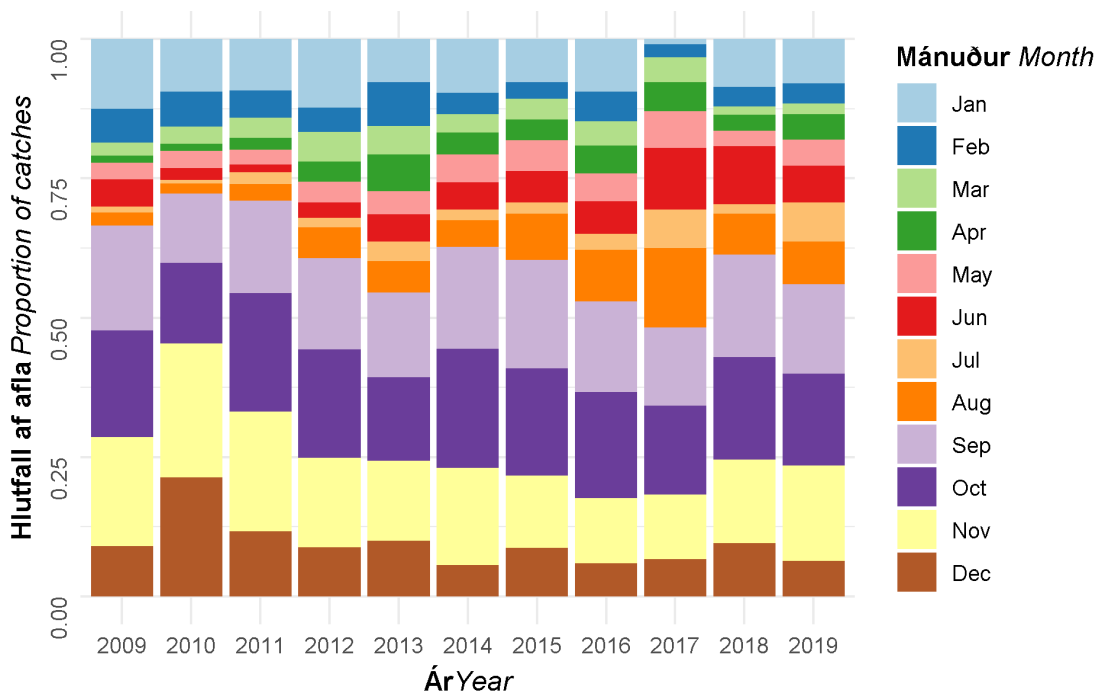


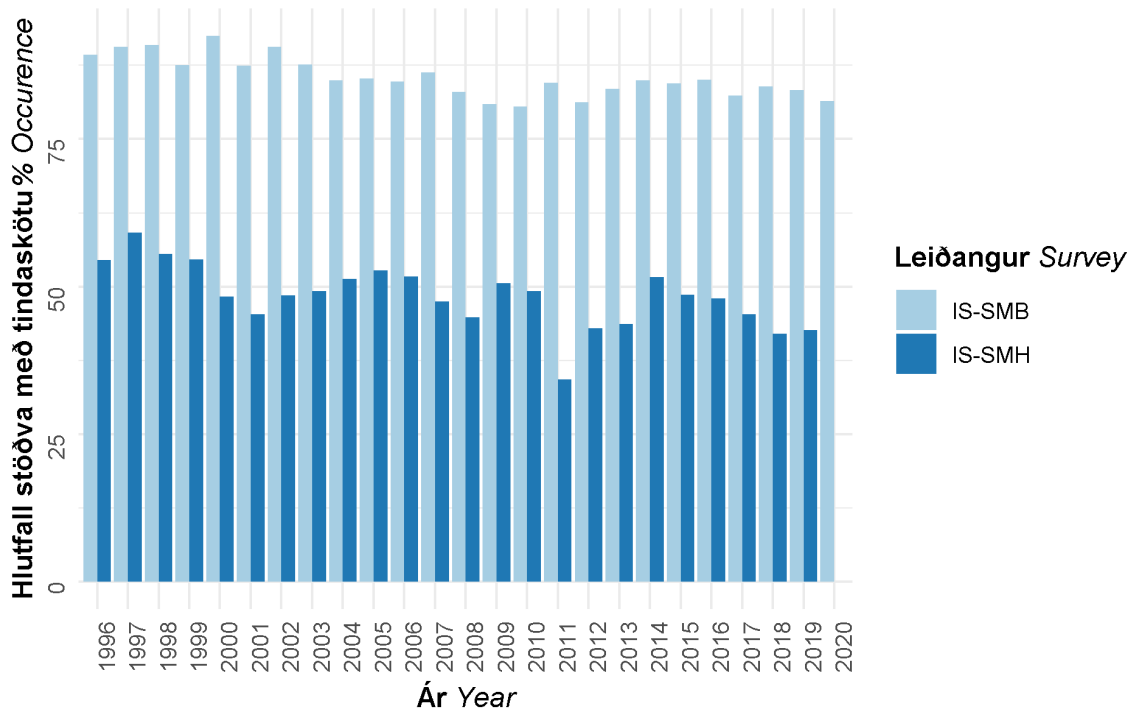
Figure 3. Starry ray. Proportion of monthly catch to each year since 2009.

Mynd 3. Tindaskata. Hlutfallslegur mánaðarlegur afli á ári frá 2009.

## SURVEY DATA

## DISTRIBUTION AND BIOMASS INDICES

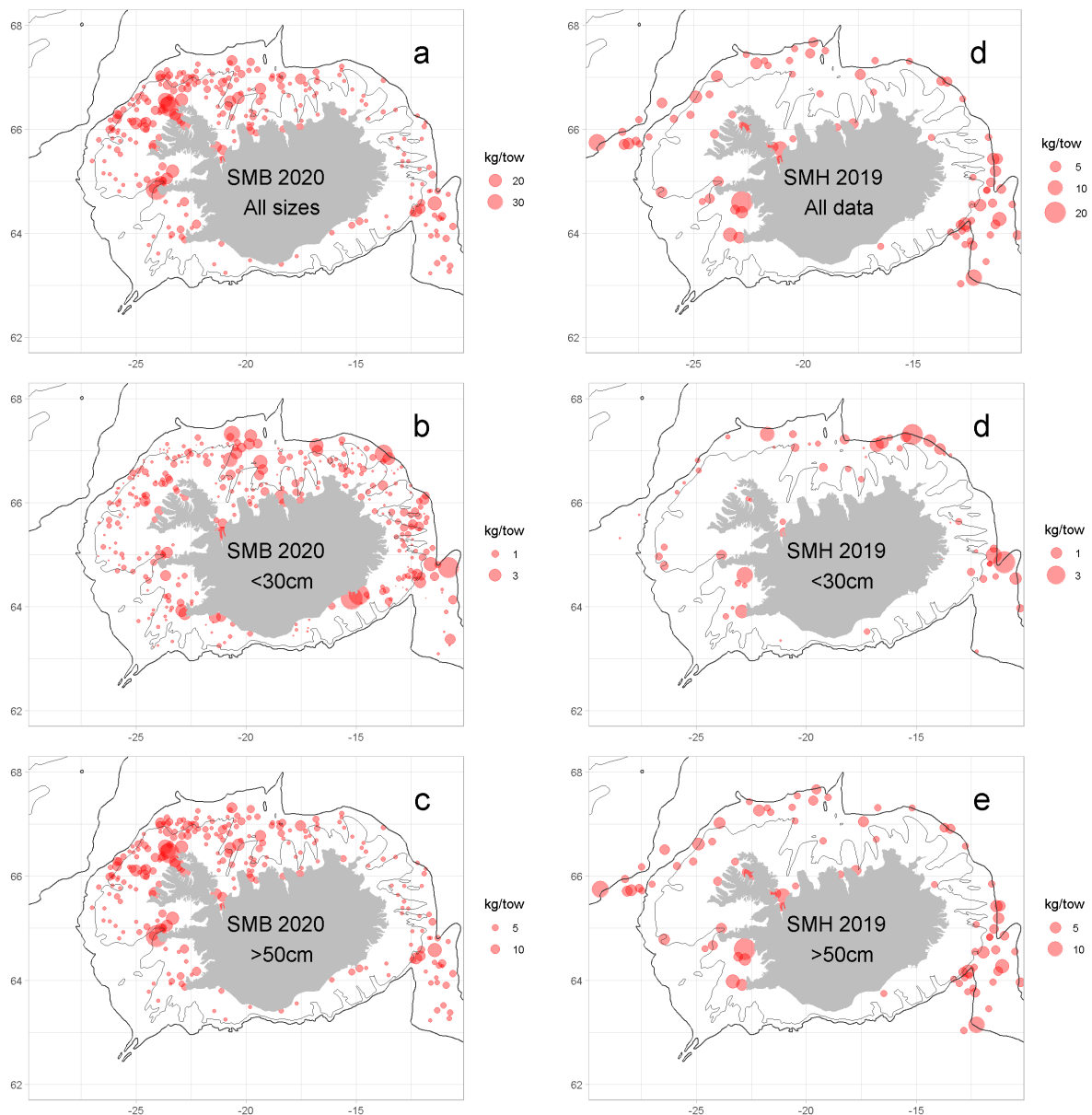
Starry ray is a frequent catch in MFRI spring and autumn surveys. Seasonal differences in distributional patterns have been noted, with starry ray much less abundant on the shelf in the autumn survey (IS-SMH) than in the spring survey (IS-SMB). In the spring survey, starry ray is found at 86% of all stations, but at about 50% of stations in the autumn survey (Figure 4).



**Figure 4. Starry ray. Frequency (occurrence at % stations) in spring survey (IS-SMB) and autumn survey (IS-SMH).**

*Mynd 4. Tindaskata. Tíðni tindaskötu (hlutfall af fjölda stöðva) í stofnmælingu að vori og stofnmælingu að hausti*

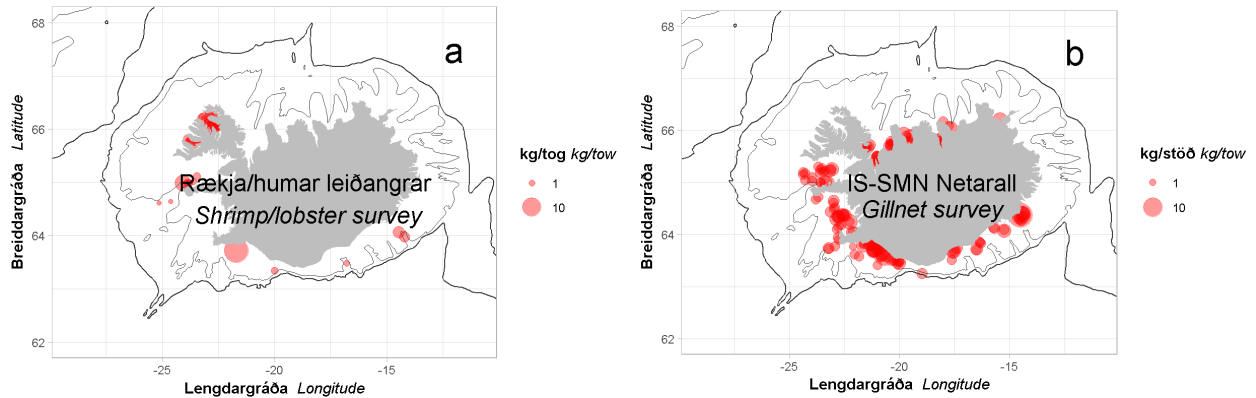
In MFRI groundfish surveys, starry ray is most abundant in the N and the NW (Figures 5, 6 and 7). In the spring survey there is a high abundance on the shelf off N-Iceland and in near-shore areas in the south and southeast (Figure 5 a). In the autumn survey, the main distribution is on the shelf break and starry ray is almost absent from the southern area. Seasonal migration could to some extent explain these seasonal differences in distributional patterns. However, the large seasonal difference in occurrence and catches, especially in the smallest length groups (>30 cm, Figure 5c and d) could also be partly explained by differences in survey gear (size and weight).



**Figure 5. Starry ray. Spatial distribution in the spring survey (IS-SMB) 2020 and the autumn survey (IS-SMH) 2019. a) SMB all data, b) SMB individuals <30 cm c) SMB large individuals (>50 cm), d) SMH all data, e) SMH individuals <30 cm and f) SMH large individuals.**

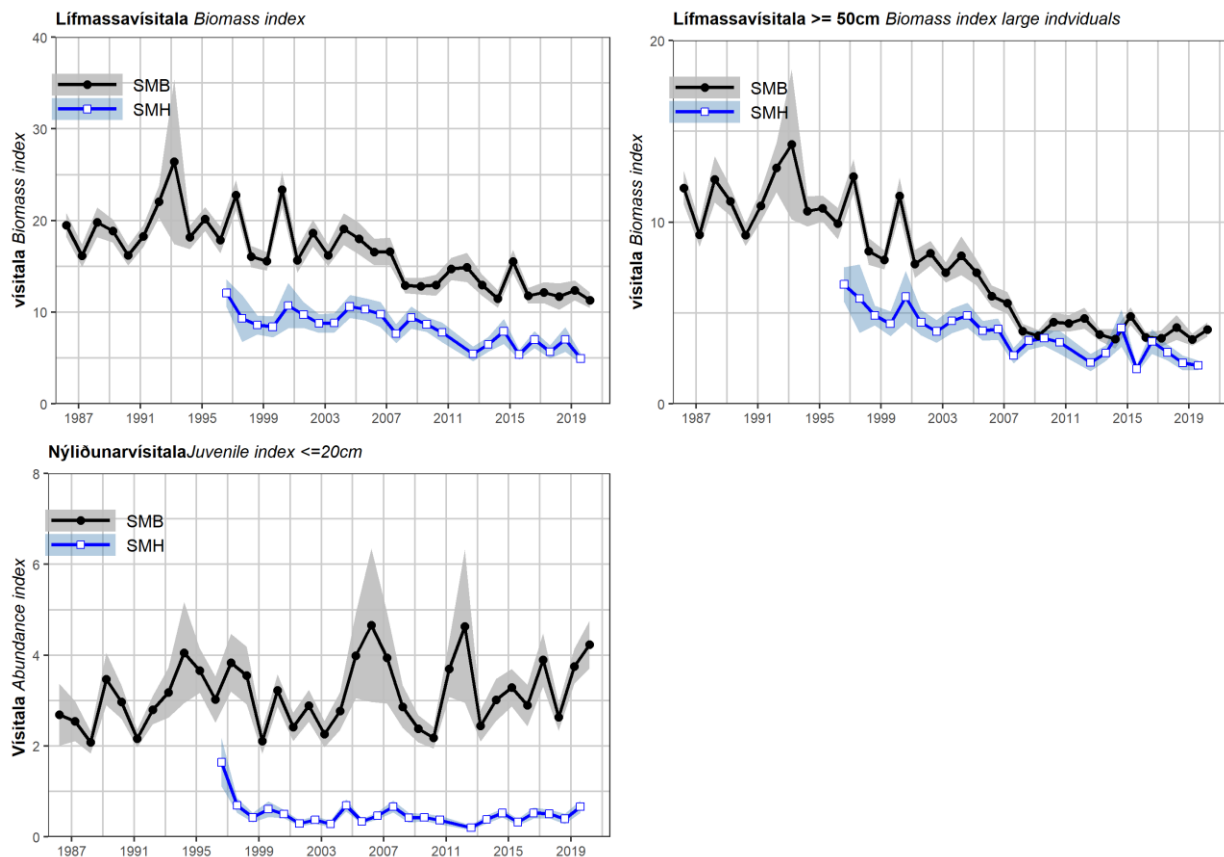
*Mynd 5. Tindaskata. Útbreiðsla í stofnmælingum botnfiska a-c) að vori 2020 og d-f) að hausti 2019.*

Starry ray is a frequent bycatch in several other MFRI surveys. The offshore shrimp survey is conducted during summer off N-Iceland and the coastal shrimp survey occurs at various time periods in fjords and near coastal areas and starry ray is widely distributed within the survey areas (Figure 6 a). Similarly, starry ray is a frequent bycatch in the gillnet survey occurring early spring each year (Figure 6 b).



**Figure 6. Starry ray. Spatial distribution in a) shrimp and lobster surveys in 2019 and b) the gillnet survey (IS-SMN) 2019.**  
*Mynd 6. Tindaskata. Útbreiðsla í a) stofnmælingum rækju og humars 2019 og b) í netaralli (IS-SMN) 2019.*

Figure 7 shows trends in various biomass indices in the spring and autumn survey and index of juvenile abundance of starry ray  $\leq 20$  cm. The biomass index in IS-SMB has decreased from 20000 tonnes (average 1985-1997) to 15700 tonnes (average 1998-2016). Decreasing trend is in particularly prominent for large fish ( $\geq 50$  cm) in years 1993-2008. Estimated biomass of juveniles ( $\leq 20$  cm) appears to be stable despite large variations in years 2003-2013 and increasing trend since 2013 is noted.



**Figure 7. Starry ray. Total biomass indices (upper left), biomass indices of large individuals ( $\geq 50$  cm, upper right) and juvenile abundance indices ( $\leq 20$  cm, lower left), from the spring survey (SMB, grey) and autumn survey (SMH, blue).**  
*Mynd 7. Tindaskata. Stofnvísitala (efri til vinstri), lifmassavísitala fiska stærri en 50 cm (efri til hægri) og nýliðunarvísitala ( $\leq 20$  cm, neðri) úr stofnmælingu botnfiska að vori (gráir ferlar) og úr stofnmælingu botnfiska að hausti (bláir ferlar).*

Estimates of total biomass of starry ray in the IS-SMB have declined over the survey period (1985-2019) and are now about two thirds of the biomass reported from the 1980's (Figure 8). Proportion of biomass by area has remained relatively stable over the time period. In the IS-SMH, total biomass indices are lower than in the IS-SMB and a higher proportion is usually found in the northern areas (Figure 9).

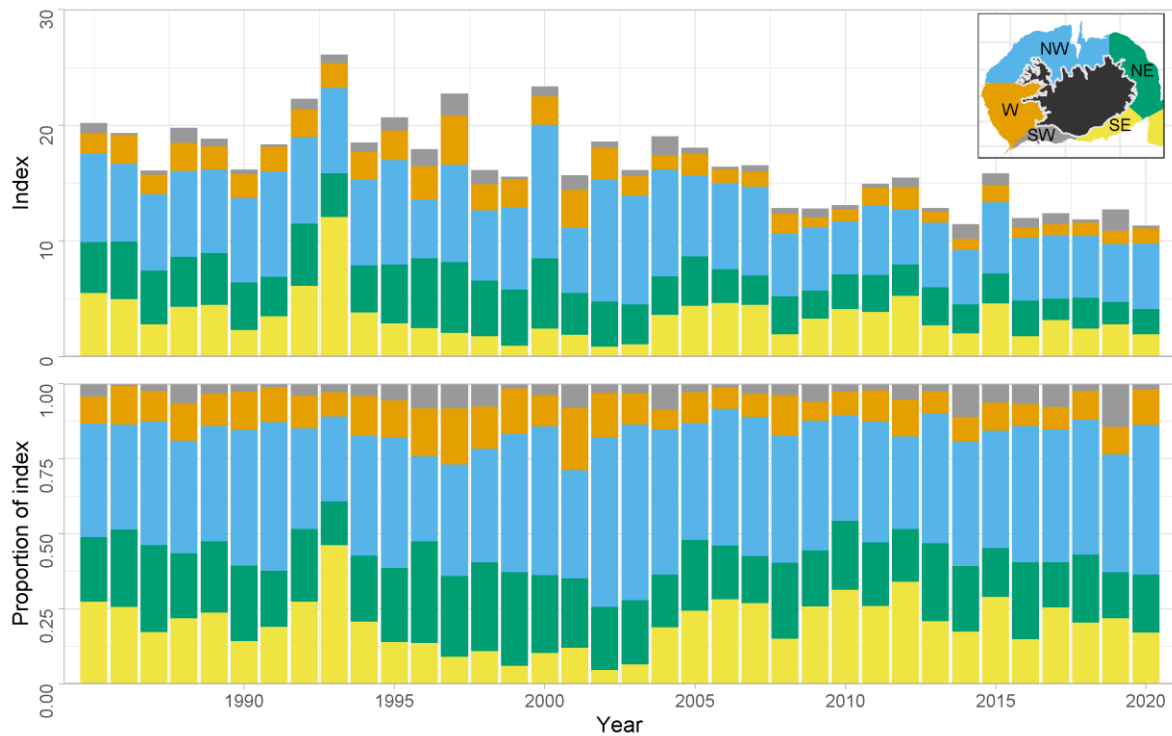


Figure 8. Starry ray. Spatial distribution of biomass indices from the spring survey (IS-SMB).

*Mynd 8. Tindaskata. Dreifing lífmassavísitölu í stofnmælingu botnfiska að vori.*

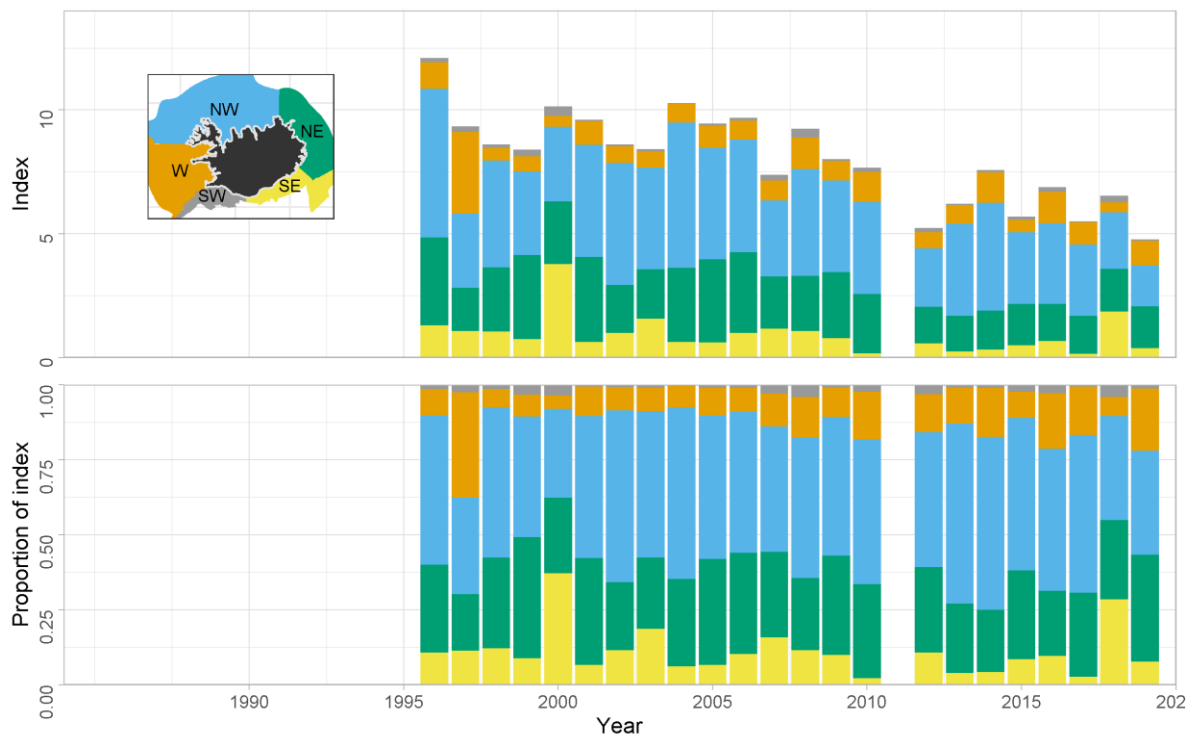
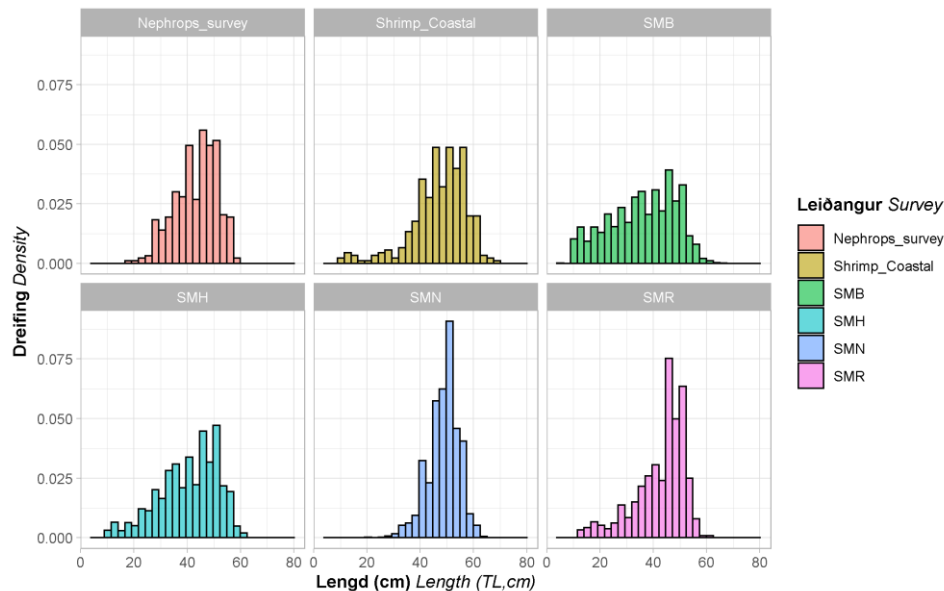


Figure 9. Starry ray. Spatial distribution of biomass indices from the autumn survey (IS-SMH).

*Mynd 9. Tindaskata. Dreifing lífmassavísitölu í stofnmælingu botnfiska að hausti.*

## LIFE HISTORY INFORMATION

Length distributions from surveys indicate that the majority of specimens are <60 cm  $L_T$ . Mean size varies from 35-49 cm depending on surveys (Figure 9). In IS-SMB, IS-SMH and IS-SMR, the length distribution is negatively skewed as the proportion of large fish decreases quite abruptly (Figures 10-12).



**Figure 10. Starry ray. Length distributions in several MFRI surveys 2016-2019. SMB: spring survey, SMH: autumn survey, SMN: Gillnet survey, SMR: Oceanic shrimp survey. All surveys use various form of bottom trawls except SMN.**

*Mynd 10. Tindaskata. Lengdardreifingar í ýmsum leiðöngurum Hafrannsóknastofnunar 2016-2019. Nephrops\_survey: Stofnmæling humars, Shrimp\_Coastal: Stofnmæling innfjarðarrækju, SMB: Stofnmæling að vori, SMH: stofnmæling að hausti, SMN: Stofnmæling þorsks með þorskanetum, SMR: Stofnmæling úthafsækju.*

Mean length in the spring survey is the lowest in all six surveys and considerably lower than mean length in the autumn survey (overall mean 36.9 and 41.5 respectively). The proportion of larger fish decreases quite abruptly after reaching 50 cm  $L_T$  (Figure 11 and 12). In the spring survey, the mean length has decreased from 38 cm (average 1996-1998) to 36 cm (average 2016-2018) (Figure 11). On the other hand, in the autumn survey the mean length has varied (from 38 cm to 43 cm) over the time period since 1996 without any specific direction (Figure 12).

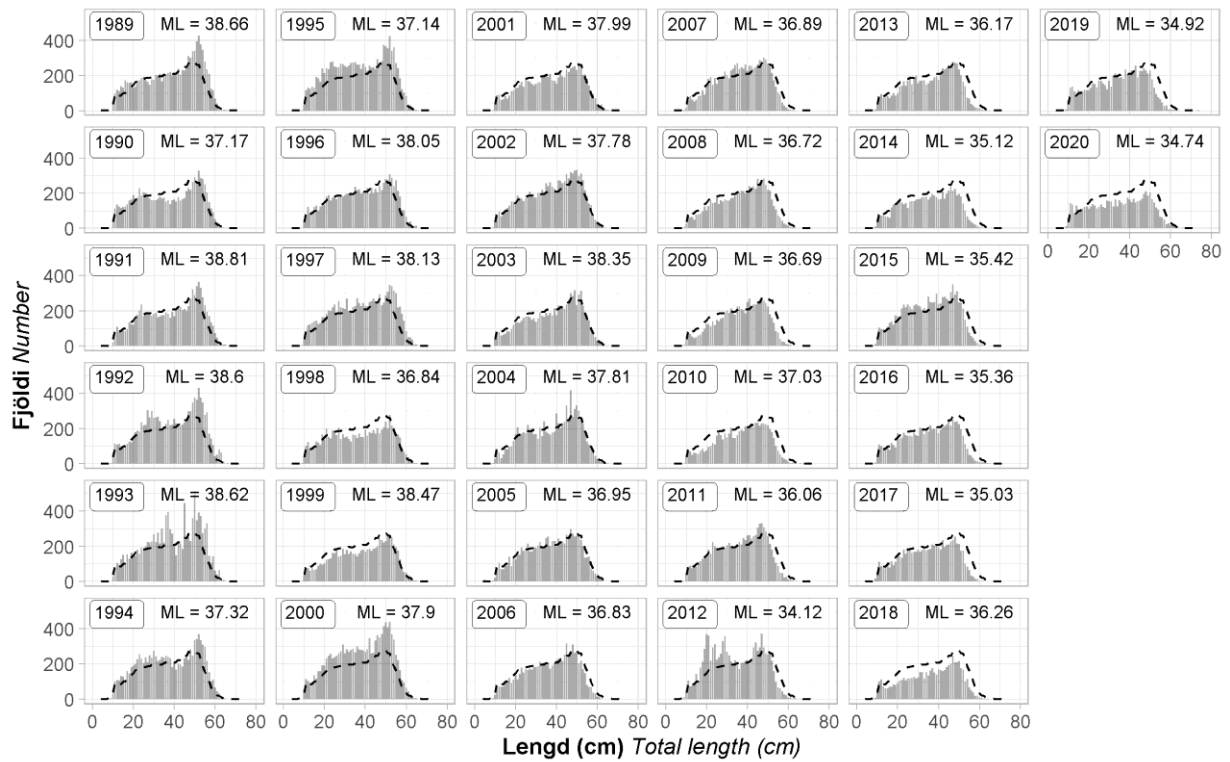


Figure 11. Starry ray. Length distributions in spring survey (IS-SMB) since 1989. Mean length (ML, cm) is indicated for each year.

Mynd 11. Tindaskata. Lengdardreifing úr stofnmælingu botnfiska að vori frá 1989. ML sýnir meðallengd hvers árs í cm.

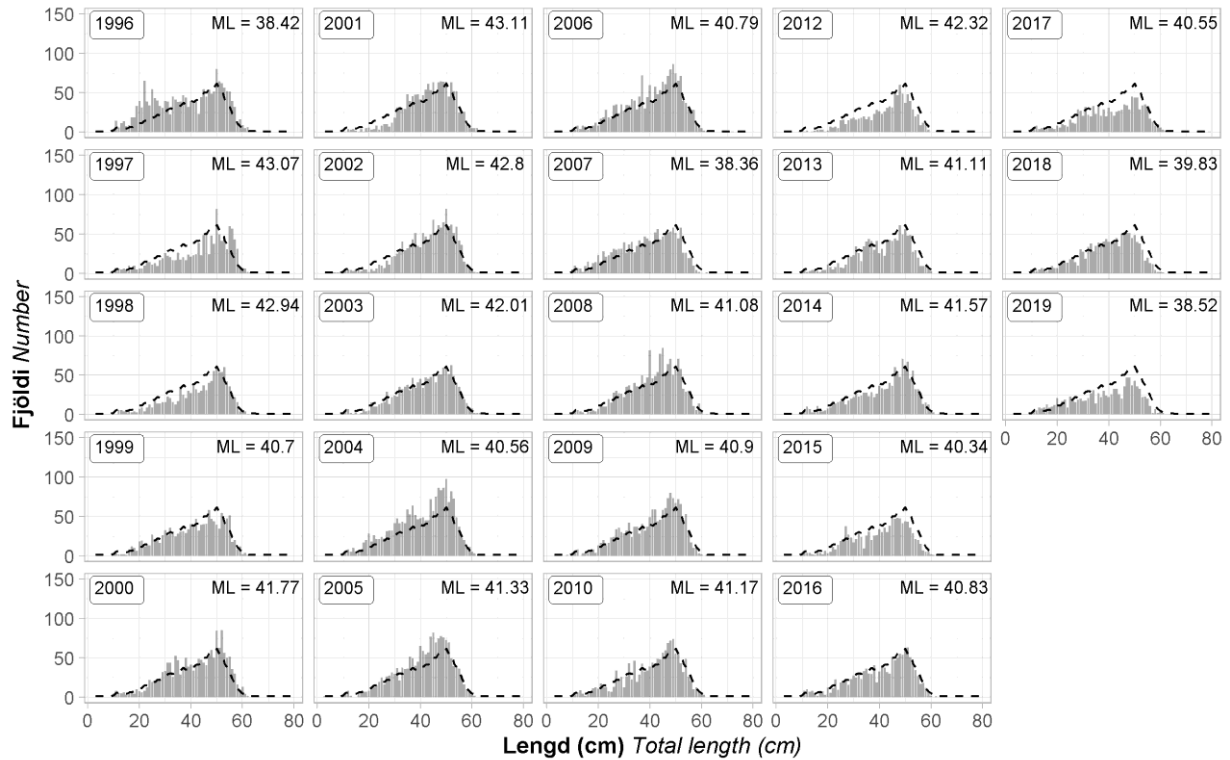


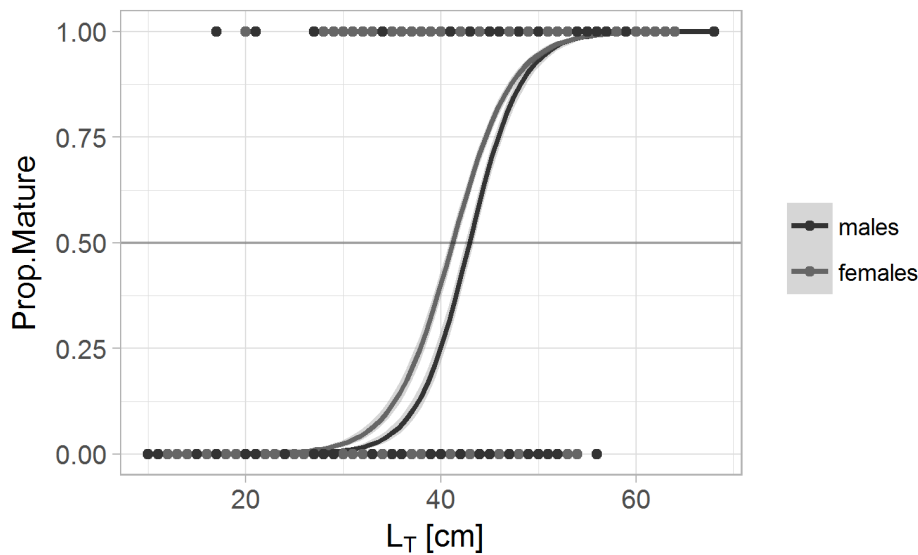
Figure 12. Starry ray. Length distributions in autumn survey (IS-SMH) since 1996. Mean length (cm) is indicated for each year (upper, right).

Mynd 12. Tindaskata. Lengdardreifing úr stofnmælingu botnfiska að hausti frá 1996. ML sýnir meðallengd hvers árs í cm.



The sex ratio is 1:1 in the spring survey, but in the autumn survey the ratio is skewed towards females (male female ratio 1:1.57). Males are on average larger than females (40.5 cm and 38.8 cm respectively). Data on maturity is sampled in autumn survey allowing for calculations of maturity ogives. Length-at-50%-maturity ( $L_{50}$ ) is 42.9 cm and 41.0 cm  $L_T$  for males and females, respectively (Figure 13).

Anecdotal information suggests that starry ray undertakes seasonal migrations related to egg-laying activity. Recently, both surveys have started to sample data on egg case distribution, but trawl survey data may provide useful information on catches of viable skate egg cases and/or nursery grounds.



**Figure 13. Starry ray. Length at maturity. Males:  $L_{50}=42.9$  cm  $T_L$ ,  $L_{95}=51.1$  cm  $T_L$ . Females:  $L_{50}=41.0$  cm  $T_L$ ,  $L_{95}=50.0$  cm  $T_L$ .**

*Mynd 13. Lengd við kynþroska. Hængar:  $L_{50}=42.9$  cm  $T_L$ ,  $L_{95}=51.1$  cm  $T_L$ . Hrygnur:  $L_{50}=41.0$  cm  $T_L$ ,  $L_{95}=50.0$  cm  $T_L$ .*

## MANAGEMENT

Starry ray has not been subject to management such as TAC limitations and hence, catch advice has not been given by the Marine and Freshwater Research Institute before 2020.

**Table 1. Starry ray. Recommended TAC, national TAC set by the Ministry, and landings (tonnes).**

*Tafla 1. Tindaskata. Tillögur Hafrannsóknastofnunar um hámarksafla, ákvörðun stjórnvalda um aflamark og landaður afli (tonn).*

Fishing year	Rec. Tac	National TAC	Catch
2010/11	-	-	1111
2011/12	-	-	1728
2012/13	-	-	1825
2013/14	-	-	1556
2014/15	-	-	1652
2015/16	-	-	1403
2016/17	-	-	1008
2017/18	-	-	552
2018/19	-	-	798
2019/20	-	-	749
2020/21	988		