

COMMON WHELK – BEITUKÓNGUR

Buccinum undatum

COMMERCIAL FISHING

Experimental fishing for whelk started in 1996 in the bay of Breiðafjörður where they fished 500 tonnes. The catch peaked the year after, reaching 1300 tonnes but has fluctuated since, ranging from 0 to 1000 tonnes. In 2019, 351 tonnes were landed, compared to 195 tonnes in 2018 (Figure 1). The catch depends highly on economic factors and the number of boats fishing each year. The minimum landing size in the fishery is 50 mm. Discard mortality is believed to be minimal as the whelks are sorted in hydraulic drums. The selection in one of the drums used has been estimated, where L50 was 53.54 mm and selection range 4.2 mm. Landing of undersized whelk (<50 mm) is infrequent.

Since 2005, whelk has only been fished in whelk pots and in 2006, five boats took part in the whelk fishery. In recent years, only one boat has been active in the fishery.

The CPUE (kilogrammes per pot) has fluctuated between years and was highest in 2003 when it reached 4.8 kg/pot. Since then, the CPUE decreased steadily, but since 2017, it has been increasing. As the CPUE does not reflect the abundance or changes in stock size (the CPUE does not account for difference in fishing effort between spatial and temporal fishing patterns), the CPUE was standardized by applying month and area factors with a Generalized Linear Model (GLM).

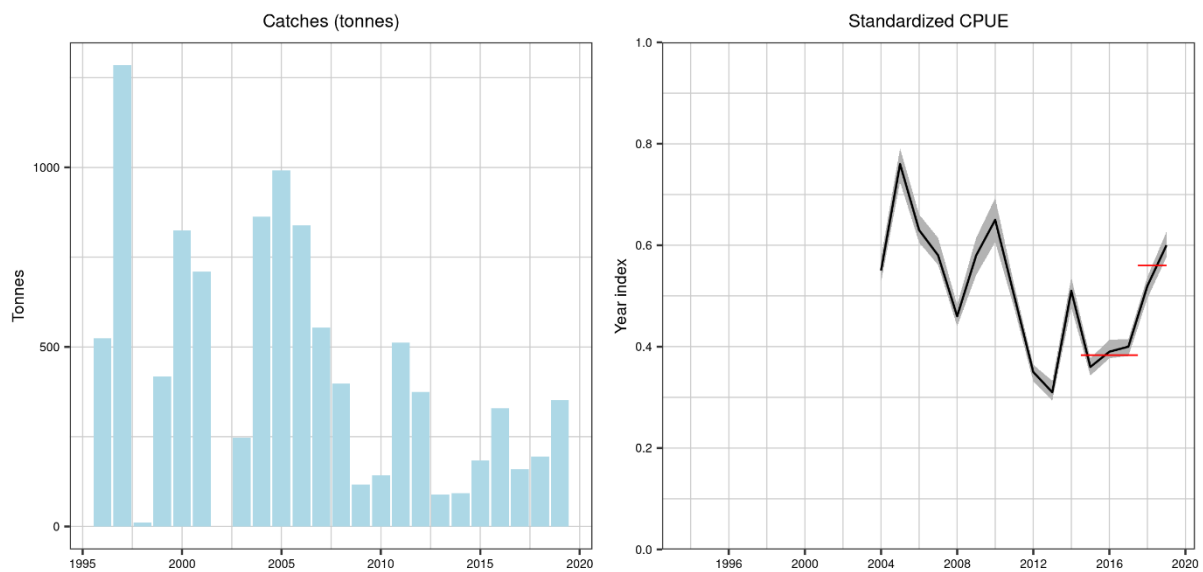


Figure 1. Common whelk. Total catch (tonnes) and standardized catch per unit effort in Breiðafjörður

Mynd 1. Beitukóngur. Heildarafli (tonn) og staðlaður afli á sóknareiningu í Breiðafirði.

In 2019, only one boat was active in the fishery and the total catch was 351 tonnes. The fishery was distributed over both the northern and southern part of the fjord, but the distribution pattern has varied over time. In 2013 and 2014, there was little fishing activity in the whole area, compared to 2011 and 2012. In 2014 to 2017 the fishing was mainly active in the southern areas of the fjord and in 2019, most of the catch is in the south (Figure 2).

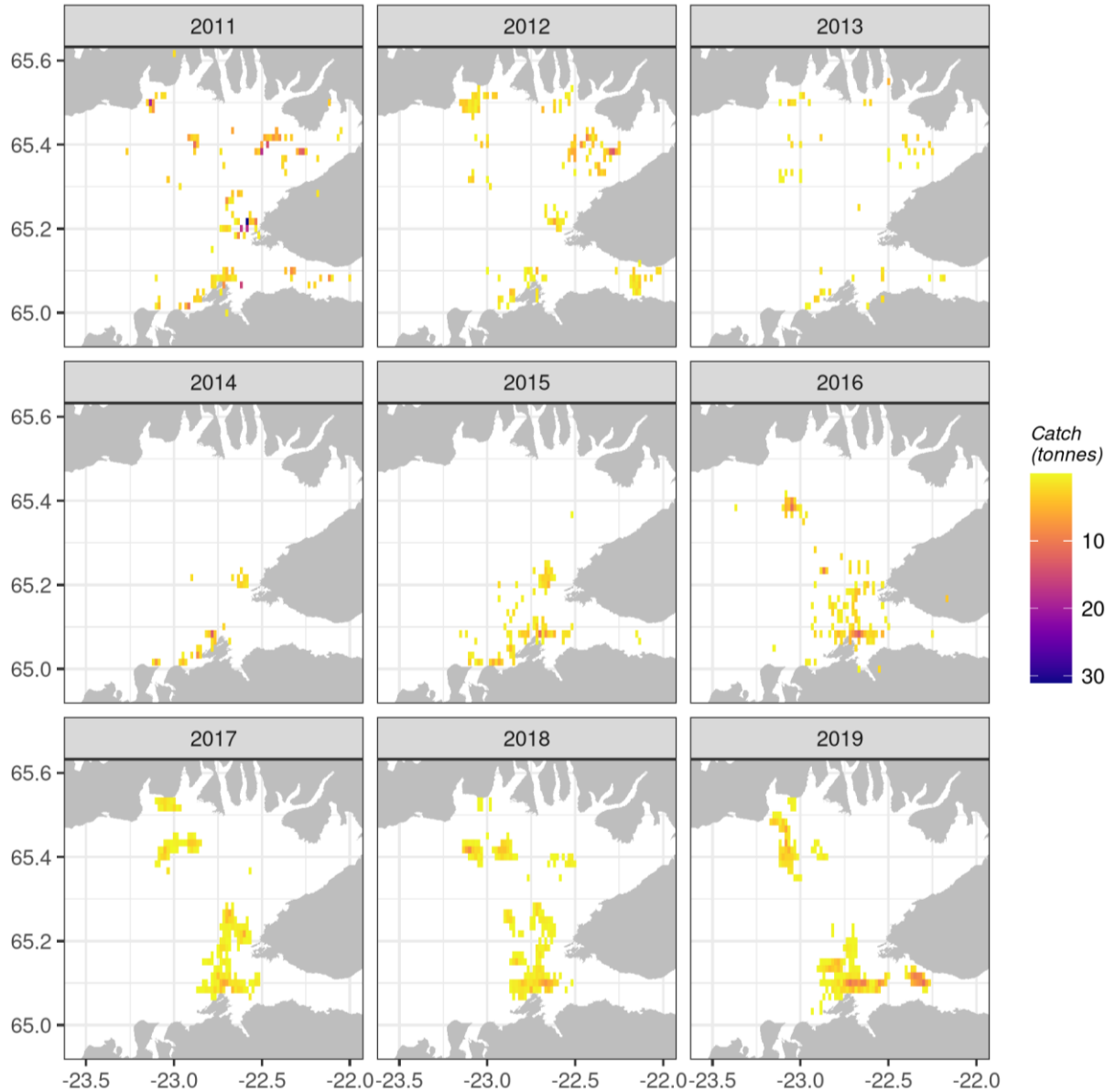


Figure 2. Common whelk. Distribution of catch in Breiðafjörður from 2011-2019.

Mynd 2. Beitukóngur. Dreifing afla í Breiðafirði 2011-2019.

In 2019, most whelk fishing took place from June-October (Figure 4) and in the southernmost part of the fjord (Figure 3)

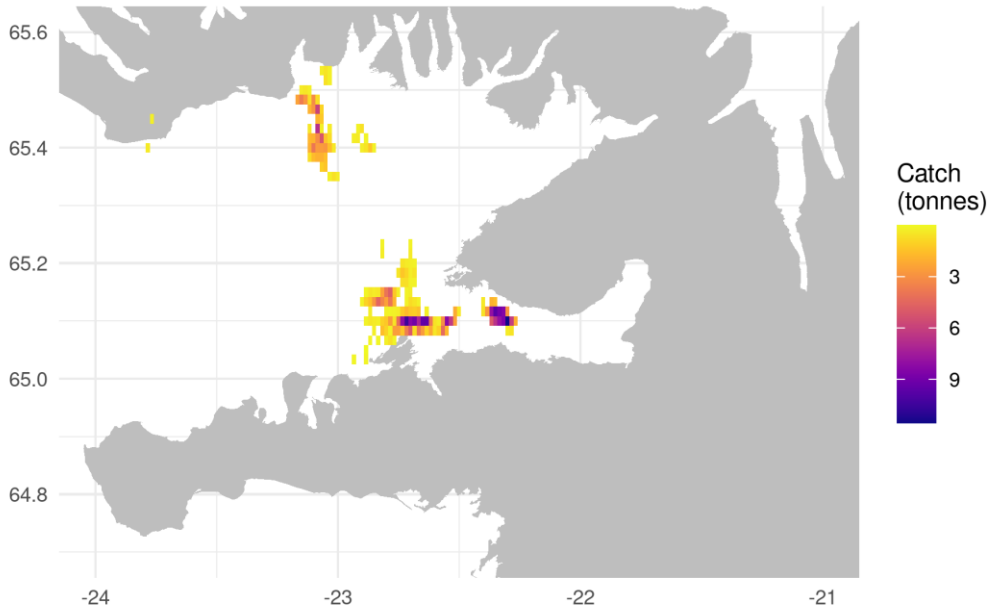


Figure 3. Common whelk. Distribution of catches (tonnes) in 2019.

Mynd 3. Beitukóngur. Útbreiðsla veiða 2019.

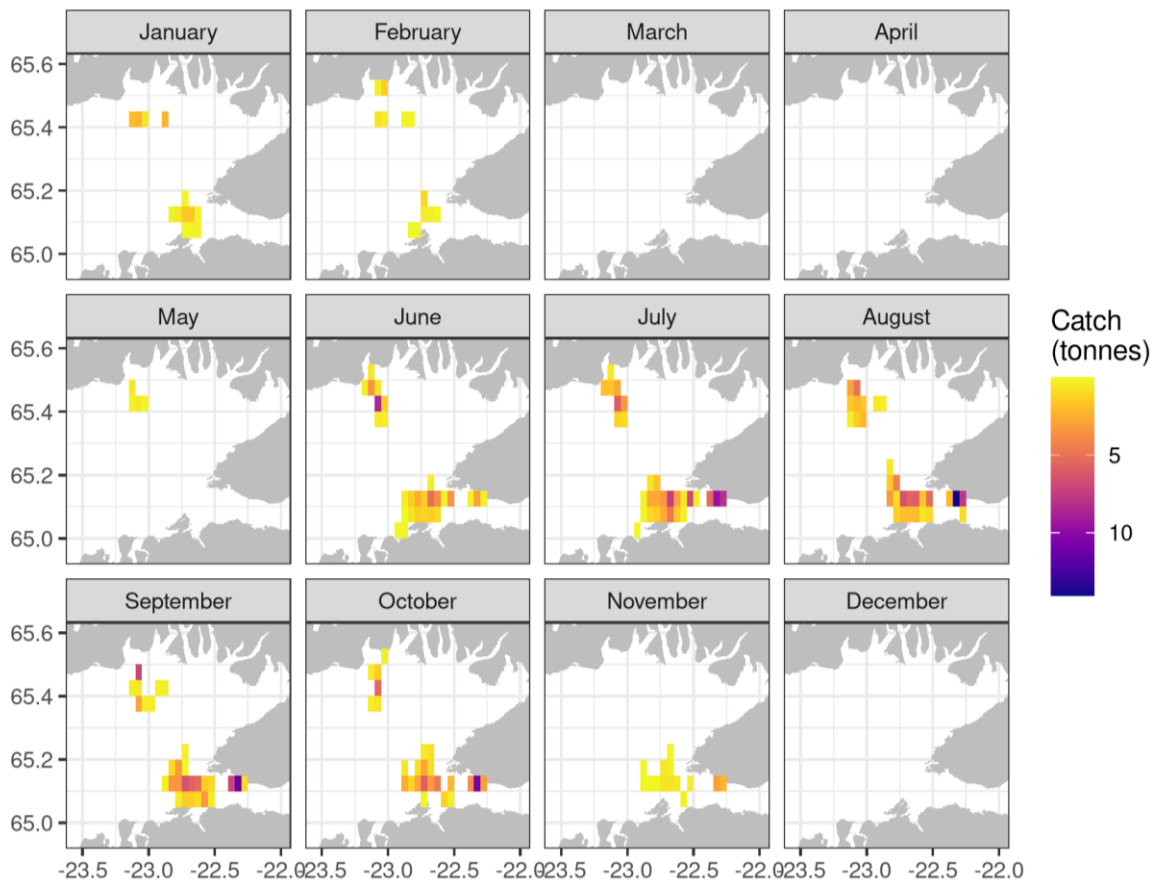


Figure 4. Common whelk. Distribution of catches (tonnes) by months in 2019.

Mynd 4. Beitukóngur. Útbreiðsla veiða frá janúar til desember 2019.

WHELK SURVEY

Two whelk surveys have been conducted in Breiðafjörður; in 1997/1998 during the first years of fishing and in 2012 (Figure 5). The survey index in 1997/1998 was 26.9 compared to 23.7 in 2012. The greatest decline between the surveys was in northwestern part of the fjord where negligible fishing had occurred. In contrast, there was a marked increase in whelk on fishing grounds in eastern area of the fjord between the surveys (Figure 5).

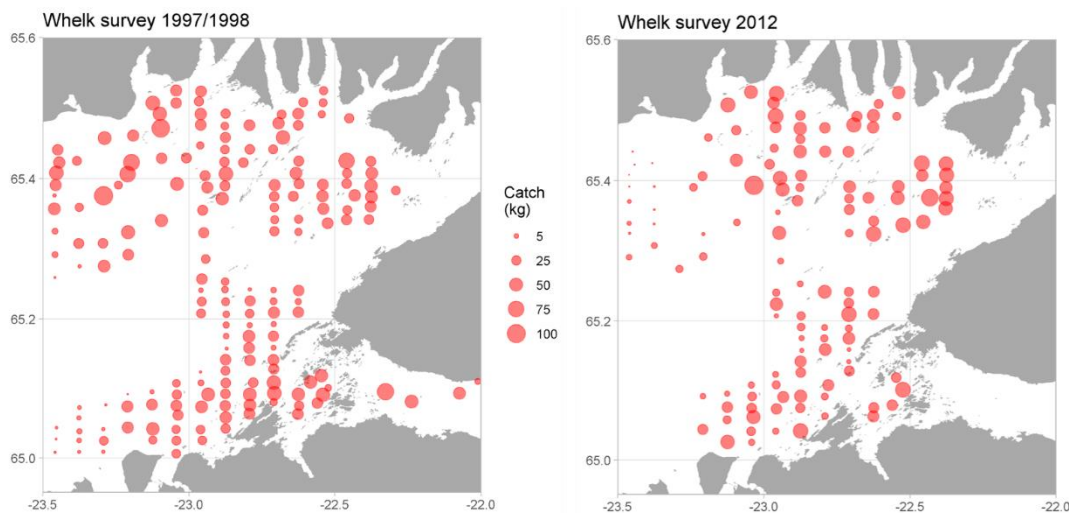


Figure 5. Common whelk. Distribution and abundance in surveys in 1997/1998 (left) and in 2012 (right).

Mynd 5. Beítukóngur. Útbreiðsla og magn í beítukóningsleiðangri árin 1997/1998 (vinstri) og 2012 (hægri).

MANAGEMENT CONSIDERATIONS

The MRI advice for whelk in 1999 to 2001 was that effort should be no more than the effort in 1997 when landings were 1287 tonnes. In the advice in 2007 it was stated that the sustainable catch level for whelk was between 800 and 1000 tonnes but there was great uncertainty about this estimate. In the advice in 2008 to 2011 there was no mention of possible magnitude of sustainable catches.

In 2012 MRI advised catches of 750 tonnes of whelk from Breiðafjörður which was unchanged until 2017. The basis of the advice was the average of annual catches during the last decade in the southern part of Breiðafjörður of 450 tonnes and additionally 300 tonnes in the northern part. In 2017 the advice is lowered to 500 tonnes for the whole of Breiðafjörður and the same advice is released in 2018. In this period (2012-2018) landed catches never exceeded 375 tonnes, therefore the advice was always more than realised catches and therefore fishing was in effect not constrained by the advice.

The advice in 2019 was based on changes in commercial CPUE (unstandardized). CPUE was relatively stable between 1996 to 2005 (Table 1) but decreased steadily to 1/3 in 2013 of the CPUE in period 1996-2005. During the decline catches of whelk were on average around 450 tonnes. It is therefore clear that fishing mortality was higher than could be sustained by whelk in Breiðafjörður. In the period between 2013 to 2018 CPUE increased again at the same time catches were on average around 190 tonnes. It can therefore be concluded that previous advice between 500 and 750 tonnes was more than the stock could sustain.

The common whelk is considered a data limited stock and follows the ICES framework for such (category 3.2) i.e. the advice is based on the ratio of the mean of the last two CPUE indices (Index A) and the mean of the three preceding values (Index B) multiplied by last years advice. The index ratio is estimated to be above 1.2 and thus, the uncertainty cap is applied. The result is advice for 2020/21 set at 264 t (220*1.2), which is a 20% increase from last year's advice.

Table 1. Common whelk. Recommended TAC in Breiðafjörður, total landings, a standardized CPUE index and CPUE (kg per pot).

Tafla 1. Beittukóngur. Veidiráðgjöf fyrir Breiðafjörð, landaður afli (tonn), staðlaður afli á sóknareiningu og afli á sóknareiningu (kg í gildru).

| YEAR / FISHING YEAR | ADVICE | LANDINGS | CPUE INDEX ¹⁾ | CPUE ¹⁾ |
|---------------------|--------|----------|--------------------------|--------------------|
| 1996 | - | 500 | - | 4.3 |
| 1997 | - | 1 284 | - | 2.7 |
| 1998 | - | 10 | - | 3.5 |
| 1999 | - | 417 | - | 3.3 |
| 2000 | - | 825 | - | 3.7 |
| 2001 | - | 709 | - | 3.6 |
| 2002 | - | 0 | - | - |
| 2003 | - | 248 | 1.00 | 4.8 |
| 2004 | - | 869 | 0.55 | 3.1 |
| 2005 | - | 991 | 0.76 | 3.8 |
| 2006 | - | 839 | 0.63 | 2.9 |
| 2007 | - | 554 | 0.59 | 2.9 |
| 2008 | - | 398 | 0.46 | 1.9 |
| 2009 | - | 116 | 0.58 | 2.6 |
| 2010 | - | 142 | 0.64 | 3.3 |
| 2011 | - | 512 | 0.50 | 2.6 |
| 2012/13 | 750 | 269 | 0.34 | 1.7 |
| 2013/14 | 750 | 0.1 | 0.31 | 1.1 |
| 2014/15 | 750 | 166 | 0.51 | 2.2 |
| 2015/16 | 750 | 332 | 0.36 | 1.4 |
| 2016/17 | 750 | 186 | 0.39 | 1.7 |
| 2017/18 | 500 | 171 | 0.40 | 2.1 |
| 2018/19 | 500 | 324 | 0.52 | 2.6 |
| 2019/20 | 220 | | 0.60 | 3.3 |
| 2020/21 | 264 | | | |

¹⁾ Calendar year

DIAGNOSTICS

Table 2. Analysis of deviance table. Response variable is square root of catch per unit effort (CPUE).

Tafla 2. Beitukóngur. Tafla sem sýnir niðurstöður úr GLM líkani. Svarbreytan er kvarðatróttin af afla á sóknareiningu (CPUE).

| | DF | DEVIANCE | RESID. DF | RESID. DEV | F | Pr(>F) |
|---------------|----|----------|-----------|------------|---------|---------------|
| NULL | | | 5012 | 820.56 | | |
| factor(Year) | 16 | 270.347 | 4996 | 550.22 | 180.441 | < 2.2e-16 *** |
| factor(Month) | 11 | 28.161 | 4985 | 522.06 | 27.339 | < 2.2e-16 *** |
| factor(Area) | 6 | 55.816 | 4979 | 466.24 | 99.344 | < 2.2e-16 *** |

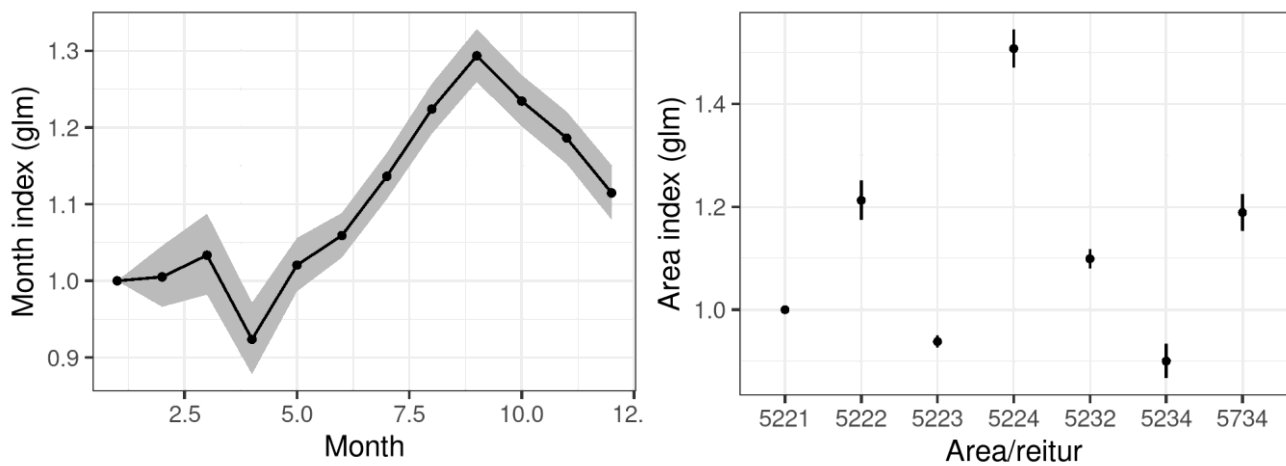


Figure 6. Common whelk. Month (left) and area (right) indices from the Generalized linear model (glm).

Mynd 6. Beitukóngur. Mánaðar (vinstri) og svæða (hægri) stuðlar úr líkani (glm).

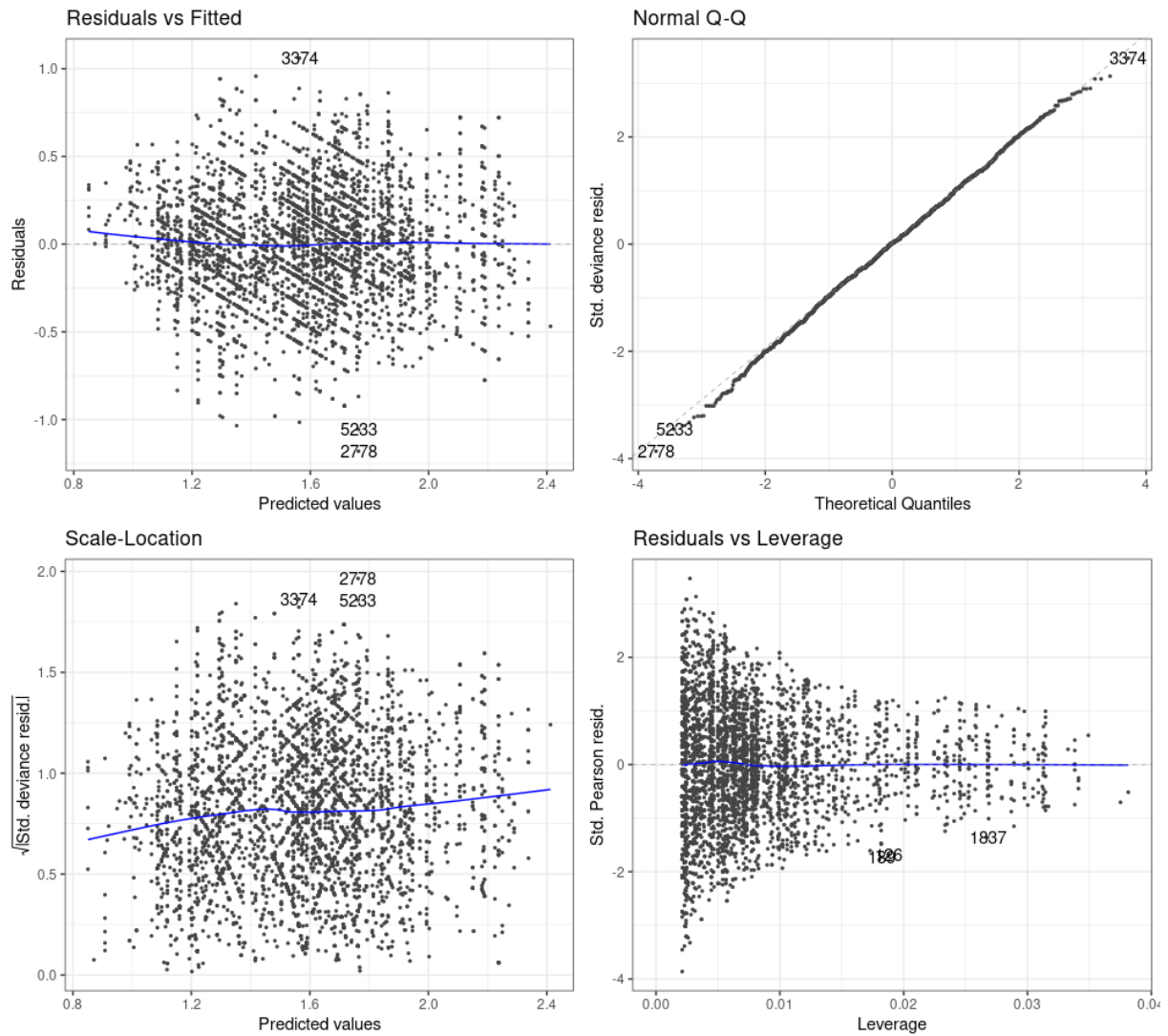


Figure 7. Common whelk. Diagnostics plots from the Generalized linear model (glm).

Mynd 7. Beítukónger. Greiningarmyndir úr líkani (glm).