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**The use of catch limits in the management of whelk fishing in the Welsh Zone.**

Dr Natalie Hold, Charlotte Colvin, Dr Adam Delargy, Prof. Lewis Le Vay

Welsh Government Funded Report

July 2021

Corresponding author: n.hold@bangor.ac.uk

Bangor University Sustainable Fisheries and Aquaculture Group, Centre for Applied Marine Science, Bangor University.

Cite as: Hold, N., Colvin, C., Delargy, A. and Le Vay, L (2021). The use of catch limits in the management of whelk in the Welsh Zone. A Bangor University Sustainable Fisheries and Aquaculture Group Report for Welsh Government.

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Whelk fishing in the Welsh Zone

This document has been prepared to set out how the monitoring of whelk stocks will be used to inform the management of the status of whelk fisheries in the Welsh zone over the next five years, and to outline future improvements, as the data series from the fishery is strengthened.

Currently, the Minimum Landing Size (MLS) is the only species level management measure for the whelk fishery in Welsh waters and this dictates the smallest size that may be sold by the fishery. Within Welsh waters, this was increased to 55mm in July 2019, and again to 65mm in July 2020, applying to all UK vessels taking whelk in the Welsh zone (Welsh Government, 2020).

Landings of whelk in Wales peaked at almost 7000 tonnes in 2017, in line with a rise in price per kg, however annual landings have subsequently declined rapidly, at just over 3000 tonnes in 2019. The increase in landings in 2017 corresponded with an increased number of vessels fishing and landing into Wales, whereby a spike in vessels <10m in length began in 2016 before peaking in 2017. Vessel numbers have since decreased to pre-2016 levels at just over 50 UK vessels landing into Wales in 2019. Reduced landings seen between 2018 and 2019 could be due to a number of factors, including effort and reduction in price per tonne. However, it is not possible to rule out declining stock numbers as a factor.

In 2020 the Welsh Government consulted on new whelk management measures including:

* An authorisation scheme for all UK vessels taking whelk with pots in the Welsh zone,
* An annual catch limit on the total amount of whelk that can be taken from the Welsh zone (ACL), and
* A flexible monthly landing cap for authorised vessels (MLC).

It is anticipated the first season of the permitted whelk fishery will start on 1st March 2022.

## Setting the ACL

As stated in the consultation, the initial ACL will be set at 5298 tonnes using the average whelk landings into Welsh ports from 2015-2019; this will be referred to as the baseline ACL. This initial ACL will prevent any further increase in exploitation in the short term. However, as more fishery and scientific data becomes available the ACL will be refined, with a medium to long-term goal of using whelk abundance estimates from annual surveys to set the ACL. This should ensure the fishery is sustainable and can support jobs and a thriving fishery both now and for future generations. Therefore, the setting of an ACL that maximises catch whilst ensuring sustainability is essential.

Many fisheries are managed through data intensive stock assessments conducted by ICES working groups, who recommend quotas and catch limits. The data requirements for these “category 1, 2 or 3” stocks are very high and require long time series. For data poor stocks, category 4, or 5 stocks, ICES recommends a precautionary approach, often applying a 20% ‘buffer’ or safety margin to an ACL that has been calculated using either average landings or abundance indices, as these assessments are recognised as having high levels of uncertainty associated with the data until longer time series have been accumulated.

Currently, the only data available for the Welsh whelk stock are a short time series of total landings, which classifies the whelk fishery as an ICES category 5 data poor stock. Even with progress and the inclusion of abundance indicators from annual stock surveys, the whelk stock will likely remain in ICES category 4 or 5 for 5-10 years. The ICES workshop (WKLIFE) has recommended that for such stocks, especially where the underlying data is unreliable and reference points are not available, a precautionary buffer be applied to avoid potential overfishing. The precautionary margin of 20% reduction from the average landings has been advised (ICES, 2012). Additionally, an uncertainty cap is suggested such that there can be no more than a 20% increase in a TAC/ACL from one management period to another (i.e., annually in the current plan). Therefore, it may be necessary to apply a buffer to the ACL if stock health is assessed as poor or there is insufficient data. To improve the assessment of the health of the stock and to avoid a precautionary 20% buffer being applied to the ACL, ICES recommend the use of a number of size-based indicators, with reference points (see glossary), that can be calculated from the individual size frequency distribution of whelk landings to inform management decisions. Accurate and timely data from fishers will play an important role in informing such decisions. These size-based indicators will enable scientists to assess the sustainability at the current exploitation rate, which, in turn can be used by managers to lower or remove any precautionary buffer on the ACL for the upcoming season if they indicate the stock is healthy. As more data is accumulated over time, size-based indicators can allow for better assessment of the stock and exploitation rates in terms of Optimal Yield (OY) and Maximum Sustainable Yield (MSY) (see glossary for definitions).

## Gathering data on the Welsh whelk stock

The management methods outlined above, that aim to ensure the stock is sustainable now and for future generations, require a range of data collected accurately and consistently. Some of these data will be collected through an annual stock survey by scientists but a significant amount of required data is “fishery dependant” data, and will need to be provided by the fishing industry themselves. Table 1 defines these data, how they will be collected and their purpose. It is important to note that these are the data required for the current assessment and management plan. Research into whelk biology and stock assessment methods is ongoing and these will be reviewed at year three (2024).

The reference points needed to assess the indicators have been calculated using growth and maturity data from whelk surveys conducted by Bangor University in the Welsh zone during 2021. This work will continue on an annual basis, and be used to improve our understanding of the stock.

In addition to high quality raw data from the annual survey, individual size range data from landings will be gathered throughout the fishing season, although when less fishing takes place during the winter months this may not be practicable (Table 1). These fishery dependant size data will be collected through port and processor sampling using a labelled bag scheme.

Table 1: Data required for the management of Welsh whelk from 2022-2024.

|  |  |  |
| --- | --- | --- |
| **Data** | **Method of collection** | **Purpose** |
| Monthly Landings | Welsh whelk catch return form. By midnight on the last day of each month. | Monitor landings against the Annual Catch Limit to ensure they don’t exceed the ACL and to ensure the fishery is spread across the whole year, as is currently the pattern of fishing. |
| Effort – number of pots fished | Welsh whelk catch return form. By midnight on the last day of each month. | This will be combined with landings to start a Landings Per Unit Effort (LPUE) time series. This will be used in the medium to long term to monitor the health of the fishery. |
| Length profile of whelk landed | Length data collected across Wales from whelk landings in March, June, and September. | To calculate the size-based indicators. If there is enough fishing taking place in the winter an additional sample will be collected in December. |
| Average largest hypothetical whelk (Linf)and size at maturity (LMAT) (see glossary) | These will be calculated from annual stock survey data. | These are required to calculate the reference points that the size-based indicators are assessed against. Current values are from 2021 surveys and from research in 2015/16. These should be monitored over time and will be reviewed at year three (2024). |

## Stock health indicators

Four size-based indicators and their reference points recommended by ICES (WKLIFE, 2012, 2014, 2017), will be used to provide an assessment of stock health. Multiple indicators are advised to avoid any bias or uncertainty within any individual indicators (WKLIFE, 2017). Two of them focus on assessing the presence of larger animals in the population that contribute to reproduction and maintaining the size and age composition of the stock. The other two indicators focus on animals smaller than the MLS, and therefore represent the stock that will be available to the fishery in the coming years.

Reference points for each indicator are calculated from individual growth curves (size at age) or size at maturity estimates and are calculated from survey data.

### **Indicator 1: The mean size of the largest 5% of landings (Lmax5%)**

This indicator compares the ratio of the mean size of the largest 5% of individuals in the landings (Lmax5%)to theaverage largest hypothetical size (Linf) calculated from growth curves. This ratio, (Lmax5% /Linf,) should be greater than 0.8 if the stock status is to be considered healthy.

### **Indicator 2: The proportion of “mega spawners” in the landings (Pmega)**

This indicator assesses the proportion of the catch that are classified as mega spawners. This is defined as the proportion of the catch that are above the optimum length (Lopt) + 10%. This optimum length is approximately 2/3Linf. The reference point is that Pmega should be greater than 0.3 if the stock status is to be considered healthy.

### **Indicator 3: The Length at the 25TH percentile of the landings (L25%)**

This indicator compares the length of the 25th percentile of the landings to the size at maturity (LMAT). The reference point uses the ratio of L25% / LMAT and should be greater than 1 if the stock status is to be considered healthy.

### **Indicator 4: Length at first capture (Lc)**

This indicator has been adapted from the ICES length at first capture indicator. In a fishery with a MLS and with high survival of discards, the length at first capture can be approximated as the MLS (WKLIFE, 2014). The ratio of Lc / LMAT should be greater than 1 if the stock status is to be considered healthy. In the case of the Welsh whelk fishery Lc will be equal to 65 mm at the present time.

In September each year, following the annual survey, the four sized-based indicators will be calculated for the stock. They will be classified as either; Green, Amber of Red as shown in Table 2.

Table 2: The classification criteria for the sized based indicators.

|  |  |  |  |
| --- | --- | --- | --- |
| **Indicator** | **Green** | **Amber** | **Red** |
| **1: Lmax5%** | Lmax5% / Linf > 0.8 | Lmax5% / Linf = 0.8 | Lmax5% / Linf < 0.8 |
| **2: Pmega** | Pmega > 0.3 | Pmega = 0.3 | Pmega < 0.3 |
| **3: L25%** | L25% / LMAT > 1 | L25% / LMAT = 1 | L25% / LMAT < 1 |
| **4: Lc** | of Lc / LMAT > 1 | of Lc / LMAT = 1 | of Lc / LMAT < 1 |

Scientists will use the indicators to advise fishery managers if there is a need to apply a precautionary buffer:

1. If the stock shows all green indicators, then no buffer will be applied.
2. If the stock shows all red indicators, then the ICES recommended 20% buffer will be applied.
3. Amber indicators will be considered “green”, unless scientists provide additional evidence to suggest the stock is not in good health. This would include a declining trend in the indicators over time or increased uncertainty in the data (e.g. through poor compliance with monthly catch returns).
4. In line with ICES advice, a 20% buffer should be applied to the ACL if there is any uncertainty in the health of the stock. Therefore, in the case of a mixed set of indicators, ICES advice would indicate a 20% buffer should be applied. However, scientists could recommend a buffer less than 20% if there is evidence to support the decision. Such evidence could include indicators very close the reference value with increasing trends for example.

## How the ACL will be set over the first five years

The approach taken will be to retain the baseline ACL (5298 tonnes - average landings 2015 -2019) for years 1 to 3 (i.e., 2022, 2023 and 2024). In year 1, 2022, no buffer will be applied as data is collected on the size based indicators. During 2023 and 2024 the size-based indicators will be used to determine if a buffer should be applied to reduce the ACL if they suggest poor stock status, however, during this period there will be insufficient data to increase the ACL.

In the first three years of the fishery, catch data from permitted fishers (including catches, pot numbers and soak times) and annual density surveys will be used to calculate Relative Abundance estimates and start a time series of Catch Per Unit Effort (CPUE) and Landings Per Unit Effort (LPUE). Any other relevant scientific research which improves understanding of the stock status may also be considered. In year three, 2024, a review of the ACL methodology will be conducted to consider all the accrued data and will determine if sufficient evidence has been gathered to change the ACL calculation methodology, using abundance data from the annual surveys calibrated against other parameters such as CPUE.

Therefore, in 2025 and 2026 although size-based indicators will still be used, it is anticipated other parameters including those based on Relative Abundance will be used to enable a less precautionary approach, where the ACL can be both increased or decreased based on evidence. A further review will take place at the end of year 5 (2026) to assess the ACL methodology against all the data gathered and whether any further improvements can be made.

Table 3: Summary of the planned ACL methodology from 2022-2026.

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **ACL set using** | **Method** | **Buffer** |
| Year 1: 2022 | Baseline ACL of 5298T | Average landings  2015-2019 | Fixed - no buffer |
| Year 2: 2023 | Baseline ACL of 5298T | Average catches  2015-2019 | If required using size-based indicator assessment |
| Year 3: 2024 | Baseline ACL of 5298T | Average catches  2015-2019 | If required using size-based indicator assessment |
| REVIEW OF METHODOLOGY | | | |
| Year 4: 2025 | Baseline ACL set using abundance data from surveys if possible. | Annual Survey | If required using size-based indicator assessment and CPUE/LPUE trends |
| Year 5: 2026 | Baseline ACL set using abundance data from surveys if possible. | Annual Survey | If required using size-based indicator assessment and CPUE/LPUE trends |
| REVIEW OF METHODOLOGY | | | |

## Monthly Landings Cap

To safeguard the whelk stock and ensure the sustainability of the fishery, once the ACL is set it will be important to ensure it is not exceeded. This will be achieved using Monthly Landing Caps (MLC) which will be issued to each individual permitted vessel.

Initially, at the start of each season on 1st March, each permitted vessel will be issued with an MLC of 50 tonnes. This figure may be changed on a monthly basis, as required, to ensure the ACL is not exceeded and the fishery is spread across the year.

Historic catch data from the reference period shows that whilst the total annual catch varied between years, the percentage of the total annual catch taken in any given month was consistent (see Figure 1, Table 4). For example, this shows that every year April-July have been the most productive months accounting for just over half the annual catch (52%) whilst catches from August to February are relatively low.

Figure 1: Average monthly whelk landings into Welsh ports and average number of vessels from 2015 – 2019. Bar chart shows landings and numbers above indicate the monthly average tonnes and the bars indicate the variability over the 5-year period calculated as standard error. The red line shows the average number of vessels landing.

Figure 2: **Monthly Catch Profile** – Average percentage of the total annual whelk landings into Welsh ports by month from 2015-2019.

Therefore, once an ALC is set it can be apportioned across the months of the year using the consistent monthly averages above (see example in Table 4). This will enable monthly maximum catches to be set for each month of the year to create a ‘monthly catch profile’ that allows the existing pattern of fishing/landings to continue across the year. This monthly catch profile will subsequently be used to create a ‘cumulative monthly catch profile’ for the year ahead that will create the ‘ceiling’ for catches during the year to ensure the ACL is not exceeded (Figure 3).

Figure 3: **Cumulative Monthly Catch Profile**. Average cumulative percentage of total annual catch over the year from 2015-2019.

Once the fishing season starts, it will be **important that all permitted fishers submit accurate monthly catch returns before midnight on the last day of each month, even if they have not fished**. This information will be used to compare the combined catch of the whole fleet with the ceiling outlined above. If the ceiling is exceeded, the MLC will be reduced to conserve the whelk stock and avoid over-exploitation using the procedure set out in Table 4. The recommended reductions in the MLC have been made on the assumption **all** permitted fishers submit monthly catch returns. If all fishers do not submit accurate monthly catch returns in a timely manner, a more precautionary approach with greater reductions in the MLC may be required. Furthermore, if there are unexpected changes in fishing activity compared with previous years, e.g., if numbers of active vessels suddenly increase, a more precautionary approach with greater reductions in the MLC may also be necessary to conserve the stock and the viability of the fishery throughout the year.

Particular care must be taken in the final three months of the season to not overshoot the ACL. If there is a sudden increase in landings in February and a large overshoot of the ACL then there may need to be a precautionary approach applied in the following season. If the MLC has been deceased and there is subsequently a significant undershoot compared to the monthly cumulative catch profile, then the MLC could be increased at the discretion of the fishery managers.

Table 4: Procedure for dropping the monthly Landings Cap if the actual landings are higher than the ceiling tonnages for achieving the ACL.

|  |  |  |
| --- | --- | --- |
| **Cumulative % over reference landings** | **Correction if more than 3 months left of the fishery** | **Correction if less than 3 months left in the fishery** |
| up to 5% | no change | drop by 5 tonnes |
| up to 10% | drop by 5 tonnes | drop by 10 tonnes |
| up to 20% | drop by 10 tonnes | drop by 20 tonnes |
| over 20% | drop by 25 tonnes | drop by 30 tonnes |

## Worked Example of adjusting the MLC

**Step 1:** 5298 tonnes are allocated across the 12 months of the permit period based on historical catch percentages and the cumulative monthly catch profile is calculated. This will act as a reference table for assessing monthly landings and monitor progress towards the ACL.

Table 5: Table showing Monthly Catch Profile and Cumulative Monthly Catch Profile for the whelk fishery with an ACL of 5298 tonnes.

|  |  |  |
| --- | --- | --- |
| **Month** | **Tonnes** | **Cumulative tonnes** |
| Mar | 592 | 592 |
| Apr | 798 | 1390 |
| May | 757 | 2147 |
| Jun | 657 | 2804 |
| Jul | 541 | 2176 |
| Aug | 361 | 3705 |
| Sep | 260 | 3965 |
| Oct | 314 | 4279 |
| Nov | 241 | 4520 |
| Dec | 199 | 4719 |
| Jan | 260 | 4979 |
| Feb | 319 | 5298 |
| **Total** | **5298** | **5298** |

**Step 2:** Fishers start with 50 tonnes MLC per vessel. The total landings in the Welsh Zone are calculated at the end of each month from the whelk Catch Return form and compared to the reference table in Step 1. If there are greater landings than the reference table (see step 1 above) advises then the procedure in Table 5 will be followed.

This procedure is cumulative, such as shown by the hypothetical landings in Table 6. i.e., if MLC is dropped by 5 tonnes in July to 45 tonnes, but landings are over the cumulative catch profile again by 7.93% in September then the new MLC would be 40 tonnes (Table 6, Figure 4).

Table 6: Hypothetical example of adjustment to Monthly Landings Cap (MLC) based on the variance from the Monthly Cumulative Catch Profile to achieve the Annual Catch Limit. Yellow highlighted cells show how the cap calculated based on the cumulative landings in one month affect the MLC in the following month.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Month** | **Monthly catch profile** | **Monthly cumulative catch profile** | **Hypothetical monthly landings** | **Cumulative Landings** | **% Variance to monthly cumulative catch profile** | **MLC decrease (tonnes) for following month** | **MLC** |
| March | 592 | 592 | 550 | 550 | -7.08 | 0 | 50 |
| April | 798 | 1390 | 800 | 1350 | -2.87 | 0 | 50 |
| May | 757 | 2147 | 800 | 2150 | 0.16 | 0 | 50 |
| June | 657 | 2804 | 780 | 2930 | 4.50 | 0 | 50 |
| July | 541 | 3344 | 650 | 3580 | 7.04 | 5 | 50 |
| August | 361 | 3705 | 300 | 3880 | 4.72 | 0 | 45 |
| September | 260 | 3965 | 400 | 4280 | 7.93 | 5 | 45 |
| October | 314 | 4279 | 210 | 4490 | 4.93 | 0 | 40 |
| November | 241 | 4520 | 120 | 4610 | 1.99 | 0 | 40 |
| December | 199 | 4719 | 100 | 4710 | -0.19 | 0 | 40 |
| January | 260 | 4979 | 260 | 4970 | -0.19 | 0 | 40 |
| February | 319 | 5298 | 300 | 5270 | -0.53 | 0 | 40 |

Figure 4 Adjustment of the Monthly Landings Cap (red line) in response to hypothetical cumulative landings (Orange bars) overshooting the Monthly Cumulative Catch Profile (Grey Bars).

The next five years of management in the Welsh whelk fishery is the start of a journey from a data poor fishery to a data rich fishery that can be managed sustainably whilst providing stable livelihoods and jobs in coastal communities now and for future generations. The fishery will be monitored, and all new data obtained will be used by management to move from a precautionary approach to an evidence-based approach. This, however, is dependent on good quality data. The Welsh Government will work closely with fisheries scientists to gather fishery independent data and use state of the art assessments. However, accurate stock assessments also require regular and accurate fisheries landings, catch and effort data. These data will be pivotal for the whelk fishery to progress from a data poor state, where a precautionary approach is required to a data rich state with more accurate stock assessments.

## Abbreviations & Glossary of Terms

|  |  |
| --- | --- |
| UK | United Kingdom |
| ICES | International council for exploration of the sea |
| TAC | Total allowable catch |
| MLS | Minimum landing size |
| LPUE | Landings per unit effort |
| CPUE | Catch per unit effort |
| iVMS | Inshore vessel monitoring system |
| MSY | Maximum sustainable yield |
| ACL | Annual catch limit |
| MLC | Monthly landing cap |
| L∞ or Linf | Largest hypothetical individual |
| L95% | Mean length of the 95TH percentile of length frequency |
| L90% | Mean length of the 90TH percentile of length frequency |
| L25% | Mean length of the 25TH percentile of length frequency of landings |
| LMax 5% | Mean size of the largest 5% of landings |
| Lc | Length at first capture |
| Lopt | Length of maximum selection |
| LMAT | Length where 50% of the animals are mature |
| P>  PMEGA | Proportion of landings greater than  Proportion of mega spawners |
| ICES Category 1 stock | “Data rich stocks (quantitative assessments)” |
| ICES Category 2 stock | “Stocks with analytical assessments and forecasts that are treated qualitatively” |
| ICES Category 3 stock | “Stocks where survey-based assessments indicate trends” |
| ICES Category 4 stock | “Stocks for which reliable catch data are available” |
| ICES Category 5 stock | “Data poor stocks” |
| Maximum Sustainable Yield (MSY) | The MSY is the largest catch that can continuously be taken without causing stock decline (Miethe *et al.,* 2019). |
| Optimal Yield (OY) | A volume of catch that is considered optimal under some temporal framework. Can be treated as MSY or some other harvest size over time (Link 2018). |
| Reference points | Values which either stipulate a desired outcome of management or a threshold for an undesirable outcome. Often these are derived from stock assessments in a framework mathematically consistent with the theory of MSY. |
| Size based indicators | Quantifiable information pertaining to the size of individuals in the population that acts as a proxy for the state of the stock and, when measured (or derived) regularly, can show changes in stock/population health against trends in exploitation rate and support data-limited stock assessments and management advice (Miethe *et al.,* 2016). |

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