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Integrated Scientific Monitoring Program for the Southern and Eastern Scalefish and Shark Fishery - discards for 2019

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1 Executive Summary

This document presents estimates of discard weight, and proportion of total catch discarded for 45 species groups over 39 strata of the Southern and Eastern Scalefish and Shark Fishery (SESSF) in 2019. Discard estimates were calculated using data collected by fishery observers as part of the Integrated Scientific Monitoring Program (ISMP) and the SESSF fishery logbook data. It is an automated report presenting data tables and descriptions of the methods used to derive these data without commentary on the implications the data may have for stock assessment or management purposes.

This report continues a series of annual reports, commencing with Thomson (2017) that fully automates the calculation method underlying the results presented. Prior to Thomson (2017) some manual calculation and decisions were required in selecting the data and calculating discarded catches. The coverage of the 39 ISMP strata is presented in Table 1 using several metrics. Discard estimates and their associated CVs for 45 species groups were calculated using Method A of Bergh et al. (2009) with those used for assessment and management purposes presented in Table 2. For those species groups where discarded catch estimates are obtained from stock assessment models, Table 3 provides discard estimates calculated using the Bergh method for comparison purposes. For each species group discard estimates are summarised by strata (Tables 4-48). Histograms of observed discarded catches are provided for each species group to assist in the identification of outliers in the data.

This report includes four species groups, not reported on in previous years: Frostfish, Latchet, King Dory and Squid. These species, along with Ocean Jackets, are not managed using commercial catch quotas in the SESSF. Each species group comprises either a single species or group of similar species either aggregated across the SESSF or split according to pre-defined zones.

The ISMP has been operating using its current design, based on Bergh et al. (2009), from 1 July 2010 until the present. AFMA have chosen to implement the PROP design that requires observers be deployed in proportion to the number of fishing days in each stratum. Originally observers were deployed throughout the SESSF for roughly 500 sea days per year, however, this has declined to around 300 days in recent years with the removal of observers from gillnet and line vessels. Note that below 500 fishing days per year, the PROP method is expected to perform poorly (Bergh et al., 2009).

This report updates the October 2020 version (Deng et al., 2020b) to add captions to the plots of observed discard weights so that the report can comply with AFMA's accessibility requirements. The October 2020 version updated the August 2020 version (Deng et al., 2020a) to correct the discarded catch estimates for Alfonsino, Blue-eye Trevalla, Blue Grenadier, Frostfish, Gemfish East, Mirror Dory West, Pink Ling West, Ribaldo, School Shark and Silver Warehou due to errors in the onboard observer weight data. Additionally, estimates of discarded catches are now separated into those used for assessment and management purposes presented in Table 2 and those for species groups where discarded catch estimates are obtained from the relevant stock assessment model and the discard estimates calculated using the Bergh method are provided for comparison purposes in Table 3.

For Blue Warehou in the east, the estimated discarded catch proportion is unreliable because the reported logbook catch of 9.4 tonnes is around three quarters of the catch reported in CDRs (12.3 t). The estimated discarded catch of Blue Warehou in the east of 23.8 tonnes is unaffected by the inconsistency in logbook and CDR catches because estimated discards are scaled to

the number of logbook shots, not catches. The under reporting of Blue Warehou in logbooks appears to be due to operators recording 'Black Trevally' (a tropical species) in e-Logs. AFMA are investigating this issue and will endeavor to correct data records and recording practices.

2 Introduction

The SESSF is composed of the former South East Fishery (composed of the South East Trawl, SET, and SE Non-trawl, SENT, sectors), the Southern Shark Fishery (SSF), which primarily uses gillnets, the Great Australian Bight Trawl Fishery (GAB), and the East Coast Deepwater Trawl Fishery (ECDW). Note that earlier groupings of these entities were called the Commonwealth Trawl Sector, and the Gillnet, Hook and Trap fishery, GHAT.

The ISMP collects fishery independent data from across the SESSF including age, and length composition of commercial catches as well as the weight of the landed and discarded components of the catch. Catch weight information is collected for quota groups as well as a range of non-quota groups including Threatened, Endangered and Protected Species (TEPS). ISMP data collections provide (1) age and length composition information that are used in SESSF stock assessments; (2) information on species compositions of the catch; (3) information on the nature and frequency of interactions with wildlife; and (4) information that can be used to estimate the annual discarded tonnage, by species group, for the SESSF. It is point (4) that is the subject of this report.

The ISMP and its forerunners were originally designed to collect data for the South East Fishery, primarily a trawl fishery (Knuckey and Gason, 2001). By 2009 a number of changes had occurred to the fishery monitored by the ISMP, most notably (i) amalgamation with other fisheries not included in the original design, to form the SESSF, and (ii) a Structural Adjustment Package (SAP) that reduced the number of fishery vessels. Consequently, a new ISMP design was developed to better match the SESSF (Bergh et al., 2009). The new design was implemented from 1 July 2010. Note that some of the zones used to define ISMP strata, the “SEF zones” have changed slightly over the years and it is the newer zone definitions that are used for this report. Thus zone definitions, but not zone names, have changed slightly throughout the history of the ISMP.

The estimates of discarding from all SESSF fishing, and non-SESSF fishing including State fishing that were presented in Appendix 4 (e.g. Upston and Thomson, 2015) of earlier reports in this series, are now presented in a separate report along with more accompanying detail as well as weighted 4 year averages of State catches and discards (Althaus et al., 2020).

The purpose of the redesign was to recommend coverage that would lead to statistically robust estimation of, amongst other quantities, estimated discards. To this end, target CVs of 20% for estimated discards were set for a range of species groups including quota and non-quota groups, as well as high risk groups (i.e. TEPS).

Bergh et al. (2009) examined five alternative methods for allocating sea days amongst ISMP strata in order to best match the target CVs for estimated discard tonnage. These methods adaptively allocated sea days in order, at each allocation step, to

1. VWCV: minimise value-weighted CV across species groups,
2. MinS: minimise CV across groups,
3. PROP: match the proportional coverage of the fishery,
4. CWCV-HR: minimise catch-weighted CV for high risk groups, and
5. MinS-HR: match the target CV for high risk species.

No particular method or level of sampling effort was recommended by Bergh et al. (2009). Their

results showed a continuum of improved performance for sampling coverage of 250 up to 1,500 sea days. The best performing methods were PROP, which allocated observer effort in proportion to the distribution of fishing effort amongst strata (method 3, above), and MinS-HR, which allocated effort to best match CV for high risk species. Both methods performed poorly when only 250 sea days were observed. MinS-HR performed well given 500 or more sea days but the PROP method required more than 500 sea days (performing well for 750 or more days) when considering the high risk species groups. At 500 sea days, the PROP method performs slightly better than the MinS-HR method for non-high risk groups, but less well than the MinS-HR method at higher levels.

AFMA have chosen to implement the PROP design, deploying observers throughout the SESSF for roughly 500 sea days per year in the past, but only around 300 days per year since the removal of observers from gillnet and line vessels. Note that below 500 fishing days per year, the PROP method is expected to perform poorly (Bergh et al., 2009). The new design was implemented from 1 July 2010 so 2011 was the first full year of sampling.

This report presents estimated discard tonnage and discard proportion for species groups in the SESSF, along with estimated CVs for those quantities. The distribution of actual ISMP effort against that of fishing effort is also presented.

2.1 Changes in December 2020

This report updates the October 2020 version (Deng et al., 2020b) to add captions to the plots of observed discard weights so that the report can comply with AFMA's accessibility requirements. There are no other changes to this report.

2.2 Changes in October 2020

This report updates the August 2020 version (Deng et al., 2020a) with the following changes:

1. Discarded catch estimates for Alfonsino, Blue-eye Trevalla, Blue Grenadier, Frostfish, Gemfish East, Mirror Dory West, Pink Ling West, Ribaldo, School Shark and Silver Warehou were corrected due to errors in the onboard observer weight data.
2. Discarded catch estimates obtained using the Bergh method are separated into species groups where they are used for assessment and management purposes (Table 2) and those where discarded catch estimates are obtained from the relevant stock assessment model and the discard estimates calculated using the Bergh method for comparison purposes only (Table 3).
3. Discard estimates that fail the validity criteria are now labeled "Fail" in the last column of Tables 2 and 3, where previously this column was blank.

2.3 Changes in August 2020

During the processing of the logbook data this year, CSIRO became aware that a number of vessels were reporting a single (invariant) depth in their e-log. Given the importance of fishing depth in the 2020 catch per unit of effort (CPUE) standardisations, SESSF Data Summary, ISMP strata allocation, Discard and Catch reports, CSIRO requested that SESSFRAG provide out of session advice on this issue. SESSFRAG agreed out of session to the following actions:

1. CSIRO undertake a correction for depth records in 2020 (data up to 2019), where shot location and GIS bathymetry data are used to establish the depth of fishing operations for vessels that have reported invariant depth records.

2. SESSFRAG discuss the matter in more detail at the SESSFRAG data meeting in August 2020 to determine the best approach for 2021 onwards. With particular emphasis on exploring the benefits of using the start position as a proxy for depth.

This report differs from the 2019 report of Deng et al. (2019a) in that:

1. The modification of depth records has resulted in changes to the catches of species for which depth is used in separating species groups (e.g. inshore and offshore Ocean Perch and Deepwater Sharks) and also for the strata dependent on depth (e.g. inshore and offshore NSW trawl).
2. Data for 2019 have been added (along with a small amount of additional 2018 data that had not yet been entered into the AFMA database prior to the 2018 summary).
3. Additional strata were created for Deepwater Shark and Orange Roughy to better represent the fishing grounds for these species. These strata are "TR_TAS_W_DWS", "TR_TAS_E_DWS" for Deepwater Shark; "TR_PED_ORO", "TR_SPH_ORO", "TR_SHH_ORO", "TR_CAS_ORO", "TR_MAA_ORO" for Orange Roughy. See the maps attached with this document.
4. Four new species groups have been added to this report in 2020: Squid (CAAB 23 636004 and 23 615000), Frostfishes (CAAB 37 440002 and 37 440000), Latchets (CAAB 37 288006), King Dory (CAAB 37 264001). These species are not under quota in the SESSF.
5. An error has been corrected where observer records with zero discards were excluded before estimating discarded catches. This error occurred when records of discarded and retained catch of a species in a shot were merged using an Outer Join. For records where a species is only retained, there is no record in the database of zero kilograms discarded so the Outer Join produces a missing (NA) value for discarded kilograms of this species in this shot. These missing (NA) values should have been converted to zero kilograms discarded. This correction has been applied retrospectively to discard estimates for 2016 - 2018 presented in Althaus et al. (2020).

We continue to apply the same changes made in 2018, i.e., strata where only one shot is observed are excluded from the calculation of discarded catch. The hit rate, the proportion of shots that encounter the species, has replaced the mean proportion discarded in the species specific summaries (Tables 4-48).

3 Methods

3.1 Data

The data are held in an Oracle database (version 11g) at AFMA. A copy of the database was provided to CSIRO using DataPump Export version 11.2 and this is held by CSIRO in an Oracle 12c R2 database. A number of known errors, such as Danish seine vessels that were recorded as using trawl gear, have been corrected in the CSIRO copy of the database. Data from differing historical periods are sometimes stored in corresponding tables that differ in format. Procedures, implemented in using SQL Developer (version 3.2.20.10), dbVisualizer 9.5.7, Python and R perform the data corrections and integrate data that are distributed across tables. Microsoft Excel for Office 365 is used to aggregate the State data and undertaken checking of calculations performed using other software. The assignment of shots to ISMP strata and the bulk of the discard calculations were done using R. Version control of the R code base is implemented using a git repository hosted on the CSIRO Bitbucket server.

Observer data was extracted from the "onboard weight" section of the CSIRO copy of the AFMA observer database. Onboard observers record the weights of both the retained and discarded components of observed fishing shots, along with species composition and associated information such as date, location, fishing gear, and weight type (whole or some form of processing). Commonwealth logbook data were extracted from the Daily Fishing Logs section of the CSIRO copy of the AFMA database.

3.2 Discard estimation

The calculations presented here follow the methodology presented by Bergh et al. (2009) whose sampling scheme was implemented by the ISMP from 1 July 2010. Since 2016, the calculation of discard rates and their uncertainty has been undertaken using routines written in R (R Core Team, 2020), replacing spreadsheet based calculations that were used previously. This change has permitted the development of clearly defined rules to select the data and calculate discard rates, removing some subjectivity in data selection of the spreadsheet based approach. While both approaches implement Bergh et al. (2009) there are some differences, mostly relating to data selection which are described below:

1. Shots are allocated to a single ISMP stratum.
2. All records of carcass weight are converted to whole weight (the old method ignored the process type field in the database; often, especially for discarded fish, the recorded weight type is whole weight, but sometimes, most often for retained fish, the process type can be e.g. headed and gutted).
3. The new software performs all the necessary steps that result in the estimates presented in this report, whereas the old software involved some spreadsheet manipulation by the user. The advantage of automation is that the calculations can be repeated quickly, easily, and without scope for untraceable human error.
4. In the past, somewhat subjective rules were applied to judge whether a discard rate was 'valid' (assessing the representativeness of the coverage of the data collection) and invalid rates were not reported. Quantifiable rules have now been selected and uniformly applied to the discard estimated for all species groups.
5. The allocation of shots to the 'Unknown' stratum might have changed, see discussion in Section 3.5 below.

This report has applied the coverage criteria described in Section 3.8 to estimate discard rates and their associated uncertainty for 2019 data using method A of Bergh et al. (2009). A recalculation of discard rates for all years for which data are available will be presented in this report next year. The conceptual differences between Methods A and B of Bergh et al. (2009) are briefly described in Section 3.7, while an evaluation of Method B will be undertaken in a future version of this report.

3.3 Observer Coverage

Observer coverage has fallen from around 500 days per year to around 300 days per year since the removal of observers from gillnet and line vessels in mid-2015. In addition many species groups that previously estimated fishery wide discard rates have now been split into eastern and western components. While the decrease in sampling and the increase in the number of species groups would be expected to decrease the precision in the estimated discard rates, the performance is worse than indicated by Bergh et al. (2009) for 250 observed shots per annum. Further investigation is required to understand why the ISMP is underperforming in the precision of the estimated discard rates.

3.4 ISMP strata and species groups

Fishing shots are mapped to ISMP strata based on spatial location, depth, gear and in some cases, the species captured. Currently there are 39 ISMP strata used to estimate discard rates. These comprise 25 trawl strata (including the newly included strata for Orange Roughy hotspots and Deepwater Sharks strata and three depth defined strata in the GAB); six line (hook) strata, seven gillnet strata and one Danish seine stratum (off Lakes Entrance). Records that fall outside of these strata are assigned to the stratum “Unknown”. Spatially, so called South East Trawl zones are used to define some of the trawl strata and shark zones are used to define the line and gillnet sectors (see Bergh et al., 2009, for rationale).

The AFMA Observers have slightly altered the original stratum design, in particular, but splitting the Danish Seine stratum off Lakes Entrance (DS_EDL) into two strata (corresponding to SET zones 20 and 60) as was done for the corresponding trawl strata (TR_EDL_IN and TR_EDL_OFF). An investigation by Deng et al. (2019a) failed to identify any records in the offshore depth range (200-1500m) and therefore a single Danish Seine stratum has been retained in this report and further consultation will be undertaken with AFMA to resolve the status of this strata.

The trawl strata encompass shots encoded on the logbook database as any of a number of trawl gear codes, these are encoded as “OT” in the Observer database. Line gears are given as “LL” or “DL” in the Observer database.

The SESSF species groups encompass recognised species (e.g. Redfish, Blue Grenadier) and populations (e.g. Eastern Gemfish, Western Gemfish) as well as species clusters (e.g. Flathead which comprises five species, and Deepwater Shark, which comprises over 20 species, split into eastern and western groups). Consequently, the term ‘species group’ is used in this report instead of ‘species’.

Note that the abbreviated stratum names used by Bergh et al. (2009) for trawl strata and the Danish seine stratum have been renamed, moving the “TR” component of the name to the beginning, for consistency, because all other strata have a gear code descriptor at the start of their name. The names for the GAB strata have been shortened.

3.5 Unknown stratum

There are two kinds of record that are not assigned to ISMP strata (a) records that clearly do not fall into any of the ISMP strata; and (b) records for which information are missing. Examples of the first kind are records that belong to a fishery that does not fall within the SESSF (such as the High Seas fishing, the small pelagic fishery or a tuna fishery); or records that fall outside of the specified depth range for the area in which they occur; or records that use a gear type for which no corresponding stratum exists in the location of fishing e.g. any Danish Seine fishing outside of the Eden-Lakes Entrance region. The second kind of record are those for which key information such as fishing location (lat-long) or depth are missing so that their stratum cannot be determined. Future versions of this report will investigate using bathymetry data to assign a depth to records with fishing location but no recorded depth.

Records belonging to the first category will not be recognised as belonging to an ISMP stratum regardless of whether they are logbook or observer records. Those belonging to the missing data class tend to be logbook records – observer records seldom if ever lack key information.

3.6 Commonwealth and State landings

Records of Commonwealth landings from Catch Disposal Records (CDR) and logbooks were reported in Appendix A4 of earlier reports (e.g. Upston and Thomson, 2015) in the series of which this report is the latest. The methods used in compiling those data have now been documented and the landings data are presented in a separate report (Althaus et al., 2020). That report also presents the estimated total discard tonnage, obtained by applying the discard proportion (also known as 'discard rate') presented in this report, to the estimated total landings. Consequently this report has no Appendix A4. This report presents an estimate of the discard tonnage for all shots reported in the logbooks that fall into ISMP strata (the vast majority) as well as the discard proportion (or rate).

3.7 Discard calculation

The Observer database does not currently include a key that permits observed shots to be paired with fishing shots from logbooks. Therefore, to match the observer and logbook data, a "shot" has always been defined as a unique combination of the following fields from the database: Year, Month, Day, Latitude, Longitude, Gear, CallSign (vessel ID), Depth (min and max).

Bergh et al. (2009) proposed two methods for estimating discarded catch conditioned on shots which encounter the species of interest which are termed Method A and Method B. Both methods estimate the mean and variance of the discarded catch by stratum and aggregate over strata to obtain estimates for the fishery, they are briefly described below

- Method A estimates the discarded catch per shot from the Observer data and multiplies it by the total number of logbook shots.
- Method B estimates the ratio of discarded to retained catch from the Observer data and applies this to the total retained catch per stratum from the logbook data, corrected by the CDR.

This report applies Method A to estimate the mean and CV of the discarded catch for the species groups shown in Tables 4-48. Previous versions of this report have specified discard rate using a lower case d which is used to represent Method B in Bergh et al. (2009) To remove any ambiguity, this report now conforms to the notation of Bergh et al. (2009) using upper case D and V to represent the mean and variance of the discarded catch calculated from Method A.

The estimation of discarded catch and its uncertainty for Method A is described below. Note that for clarity of notation, year subscripts are omitted throughout:

For each species group sp in each ISMP stratum st, the mean discarded catch weight $D^{\bar{sp}}_{H,st}$ and its variance, $V(D^{sp}_{H,st})$ of shots that encounter that species group sp are

$$\bar{D}^{sp}_{H,st} = \frac{1}{n^{obs}_{st} h^{sp}_{st}} \sum_{i \in st} D^{sp}_{i}, \tag{1}$$

$$V(D^{sp}_{H,st}) = \frac{1}{n^{obs}_{st} h^{sp}_{st}} \sum_{i \in st} (D^{sp}_{i} - \bar{D}^{sp}_{H,st})^2 \tag{2}$$

where D^{sp}_{i} is the discarded catch for species sp in observed shot i, h^{sp}_{st} is the "hit rate", the proportion of observed shots in stratum st which encounter species sp and n^{obs}_{st} is the total number of observed shots in stratum st. Note that the hit rate can only be calculated from the observer data, not from the logbook data since logbooks do not accurately record discards. When a species is wholly discarded from a fishing shot, the logbook will contain no record that that species was encountered.

To account for all shots fired it is necessary to make an adjustment to $\bar{D}^{sp}_{H,st}$ based on the hit rate. Note the subscript H which represents observed shots which caught species sp is replaced by A which represents all observed shots in strata st.

$$\bar{D}^{sp}_{A,st} = h^{sp}_{st} \bar{D}^{sp}_{H,st} \tag{3}$$

and the variance of the mean adjusted discarded catch per shot is

$$V(\bar{D}^{sp}_{A,st}) = \frac{V(\bar{D}^{sp}_{A,st}) \omega^{sp}_{st}}{n^{obs}_{st}} \tag{4}$$

where ω^{sp}_{st} is the variance multiplier due to within trip correlation.

The estimate of the total discarded catch for species sp in stratum st is

$$\hat{D}^{sp}_{st} = n^{F}_{st} \bar{D}^{sp}_{A,st} \tag{5}$$

where n^{F}_{st} is the total number of logbook shots in the strata. The associated variance is

$$V(\hat{D}^{sp}_{st}) = (n^{F}_{st})^2 V(\bar{D}^{sp}_{A,st}). \tag{6}$$

The estimated SESSF-wide discard weight for species group sp, $\hat{D}^{sp}$, is the sum of the $\hat{D}^{sp}_{st}$ (equation 5) across all relevant ISMP strata (st) (note that for most species groups this does not include the GAB strata):

$$\hat{D}^{sp} = \sum_{\forall_{st}} \hat{D}^{sp}_{st} \tag{7}$$

with variance

$$V(\hat{D}^{sp}) = \sum_{\forall_{st}} V(\hat{D}^{sp}_{st}). \tag{8}$$

The SESSF-wide CV for species sp is therefore

$$\Big(\sum_{\forall_{st}} V(\hat{D}^{sp}_{st})\Big)^{1/2} / \sum_{\forall_{st}} \hat{D}^{sp}_{st}. \tag{9}$$

The "discard rate" or proportion discarded for species group sp is the estimated discard weight divided by the estimated total catch (which is the sum of the landed L^{sp}, and discarded components of the catch):

$$p^{sp} = \frac{\hat{D}^{sp}}{L^{sp} + \hat{D}^{sp}} \tag{10}$$

Note that L^{sp} is the landed catch as recorded in the logbooks, but that the weight recorded by the observers could have been used instead (assuming this is an independent measure, which it might not be).

Note that the three GAB trawl strata are excluded from the sum in equation 7 for all groups except Bight Redfish, Deepwater Flathead and Orange Roughy GAB.

Bergh et al. (2009) also describe a method of correcting the estimated variance for a lack of independence of errors within individual trips, however, this has not yet been implemented.

3.8 Coverage and validity of discard estimates

Sampling theory quantifies the performance of an estimator by its bias, the proximity to the true value and its precision, the level of uncertainty (Cochran, 1977). While stratified random sampling usually provides increased precision over simple random sampling for a given sample size, failure to adequately sample all strata in which a species is present in may lead to a biased estimate. While the CVs of the discard estimates provide a measure of their precision they do not measure the bias. Representative sampling is often used to reduce bias in surveys. To attempt to quantify whether the ISMP sampling is representative of the catch and fishing effort of each species group, decision rules were formulated by to identify whether there was adequate observer coverage (Klaer, 2009; Upston and Klaer, 2012):

1. more than 10 observed shots in the stratum that has the most shots, and
2. samples that are distributed in proportion to catches, and
3. if only one stratum is sampled then that stratum should represent at least 50% of the total catch, and
4. if there is any doubt, the fishery-wide discard rate should be broadly consistent with previous estimates (since 2005).

Unfortunately decision rules 2 and 4 are not quantified, allowing scope for subjectivity. Further, note that there is no decision rule to gauge whether sampling was seasonally representative of catches, unless rule 2 is interpreted as including seasonal spread of sampling. Rule 4 could be

invoked when a real change in discard rates has occurred, making it impossible to detect such a change.

A sub-committee of the SESSFRAG met by conference telephone on 31 August 2017 (Sandy Morisson, George Day, Dan Corrie, Miriana Sporcic, Roy Deng, Franzis Althaus, Robin Thomson) and Ian Knuckey provided written comment. The group decided to address coverage by calculating the proportion of the reported landed catch, or logbook shots, that occurred in strata for which at least 5 observations were made. A decision rule that either one of these statistics must exceed 50%, was chosen. The group also recognised that investigation of the data is needed so that this rule should be regarded as a temporary measure until information is available for making a better informed decision.

At the August 2019 Data Meeting, SESSFRAG modified the criteria used to accept discarded catch estimates to reject any discard estimates with discard CV's greater than 100%. The validity rule has been expanded to reject discard estimates with discard CV's greater than 100%.

The issue of coverage and validity has been investigated in a separate analysis presented to the SESSFRAG Chairs meetings in March 2020 (Burch et al., 2020a) which concluded that adequate rules would need to be formulated separately on a species-by-species basis. However, the overall conclusion was that a model-based approach would be best, which would obviate the need to formulate species-specific rules.

4 Results

4.1 Targets and coverage by stratum

Coverage by the ISMP is presented in Table 1 using several metrics:

ISMP Stratum: the stratum over which the metric are calculated.

Target days: the target number of sea days set by the Observer program before the start of fishing (obtained from Tamre Sarhan, AFMA, pers comm).

Prop days: a total of 317 sea days were distributed across strata in proportion to the average number of reported (logbook) sea days fished in each stratum over the most recent 5 years (reported sea days were derived from reported shots by assuming that Danish seine vessels make 5 shots per day and other gear make 2.5 shots per day). Results are rounded to the nearest day.

Prop shots: the number of fishing shots (rounded to the nearest shot) that corresponds to Prop days (Danish seine are assumed to make 5 shots per day and other gear 2.5 shots per day).

Match: The ratio of the proportion of shots that was observed per stratum (Obs shots '19 divided by its total), to the proportion of reported logbook shots per stratum (Log shots '19 divided by its total) as a measure of how successfully the proportional sample design has been followed. Ideally, all values in this column should be '1'.

Obs '17: The number of observed shots in the year 2017.

Obs '18: The number of observed shots in the year 2018.

Obs '19: The number of observed shots in the year 2019.

Log '19: The number of reported logbook shots in the year 2019.

Obs %: The percentage of the logbook shots that were observed shots in 2019.

Vess '19: The number of vessels which had observed shots in 2019 in this strata.

Mons '19: The number of months during which observations were made in 2019 in this strata.

4.2 Discard estimates and coverage by species

Tables 2 and 3 show the estimated discards by species along with measures of coverage:

Disc %: the estimated proportion of the 2019 catch that is discarded (p^{sp} in equation 10) converted to a percentage (i.e. multiplied by 100).

Disc (t): the estimated tonnage discarded in 2019.

Disc CV %: the CV of the estimated 2019 discarded catch (*Disc (t)*) displayed as a percentage.

Tot CV %: the CV of the 2019 estimated total catch (estimated discards + landed catch taken from logbooks) displayed as a percentage. Note this quantity assumes the CV of the logbook catch is zero and hence may underestimate of the uncertainty in total catch.

% Obs: the percentage of the total shots in 2019 that caught this species that were observed.

Nshot obs: the number of observed shots in 2019 in which this species was caught.

Catch % ($\geq$5): the percentage of the total 2019 catch for this species that was taken from strata that had at least 5 observed shots.

Shot % ($\geq$5): the percentage of the total number of logbook shots in 2019 that caught this

species that were taken in strata that had at least 5 observed shots. Note that this is an upper bound because unobserved logbook shots that discarded 100% of this species usually aren't recorded.

Valid?: a discard estimate will only be used in TAC calculations if it has at least 50% coverage for catches or shots (i.e. a value of 50% or greater in either the Catch % ($\geq$5) or Shots % ($\geq$5) columns).

Note that *% Obs*, *Catch % ($\geq$5)* and *Shot % ($\geq$5)* are upper bounds because unobserved logbook shots that discarded 100% of the catch of a particular species usually aren't recorded.

4.3 Discards and coverage by species and stratum

The quantities used to derive the discard estimates in Tables 2 and 3 are shown, for each species group in Tables 4-48. Species groups are presented in the same order as the Data Summary report (Burch et al., 2020b).

The columns in Tables 4-48 are:

Landings (t): The total landed catch for 2019 in each stratum from the logbook database. Note that landed catches in logbooks are often underestimated compared to CDR data.

Nobs: The number of fishing shots (gear deployments) for 2019 observed by the ISMP to have caught this species group. This is equal to the total number of observed shots per stratum multiplied by the hit rate for that species group.

Nlog: The number of logbook shots for 2019 in each stratum that reported catching this species.

Obs perc: The percentage of logbook shots for 2019 in each stratum that reported catching this species that were observed. Note this quantity can be above 100% when the number of Observed shots reported in the ISMP data is greater than the number of shots reported in the logbook data.

D/shot (kg) The kilograms of the given species group observed to have been discarded per observed shot for each stratum, multiplied by the hit rate.

NlogStra The number of logbook shots for 2019 in each stratum.

Hit rate: The proportion of logbook shots for 2019 that report catching the species group.

Dlog (t) The estimated tonnage of the species group discarded by all (logbook) shots reported in the stratum for 2019. The sum of this column is total estimated discard "Disc (t)" in Tables 2 and 3.

Disc rate The discard rate for 2019 in the stratum.

Note that the estimated total discard from these calculations (which relates to the estimated discards from all logbook shots that fall with ISMP strata) is not used when setting TACs for SESSF species. Instead, the discard proportion (estimated using the discards from this report, and landed catches from the logbooks) is applied to an estimate of the total landings, taken from verified catch records (CDRs) and including logbook landings that are not included in ISMP strata ('Other' in this report) and those not reported in the logbooks at all (State catches). The estimated proportion discarded is applied to this overall landed catch to derive a new estimate of the total fishery-wide discard tonnage; this quantity is not reported here, but is reported in Althaus et al. (2020).

4.4 Figures

This report includes a figure for each species group that shows the retained and discarded catch, the CV of the discarded catch and the CV of the total catch (retained and discarded). The figure for each species group immediately follows the table for that species (Tables 4-48).

4.5 Maps

In addition to the information on discarded catches provided in Tables 4-48 maps that the discarded tonnage by species, gear type and strata are provide in a separate document. The maps use the following abbreviations

"DR" is the discard rate as a percentage by species and stratum per shot.

"NST" represents the number of shots per species per stratum from the observer data.

"ST" is the number of shots per species per stratum / total number of shots per stratum from the observer data, equivalent to the hit-rate.

"Dcd" is the discard per species per stratum in tonne.

Table 1: 2019 Target / observed days, shots, months or vessels; 500 days / 1250 shots distributed in proportion to mean shots over last 5 years (see text for details).

ISMP Stratum	Target days	Prop days	Prop shots	Match	Obs '17	Obs '18	Obs '19	Log '19	Obs %	Vess '19	Mons '19
TR_NSW_GEM	20	3	7	1.6	12	6	6	96	6.2	3	2
TR_NSW_IN	21	14	36	1.1	48	15	61	1475	4.1	8	11
TR_NSW_OFF	15	9	22	0.8	41	26	19	597	3.2	5	5
TR_NSW_RRP	4	3	7	0.7	15	11	5	201	2.5	2	3
TR_SW_BGS		2	6	3.5	3	6	21	157	13.4	2	2
TR_SW_ORO											
TR_SW	25	16	40	1.4	58	34	103	1895	5.4	5	7
DS_EDL	42	27	67	0.3	87	78	114	8867	1.3	11	8
TR_EDL_IN	43	22	54	0.7	84	92	90	3341	2.7	11	10
TR_EDL_OFF	20	9	23	0.7	33	33	43	1573	2.7	8	9
TR_TAS_BGS	20	19	47	8.4	52	48	186	580	32.1	6	3
TR_TAS_E	26	41	104	2.6	130	109	254	2590	9.8	9	9
TR_TAS_ORO	65	2	5	12.6	10	9	13	27	48.1	3	4
TR_TAS_W	16	21	51	4.4	50	65	182	1081	16.8	3	7
TR_BS_IN		3	7		7	19		40			
GAB_Inshore		27	68			91		2298			
GAB_Midshore		1	3			6		93			
GAB_Offshore											
TR_ECDW	0	4	9	48.7	1		26	14	185.7	1	2
AL_CSA		6	16			26		1572			
AL_ESA		4	11			21		507			
AL_WBS_SAV		9	22					358			
AL_EBS_NSW		6	16	2.3	10	12	45	510	8.8	1	1
AL_ET_WT		11	27	1.4	52		31	598	5.2	1	2
AL_WSA_WA		2	6					279			
GN_CSA		4	10		14	15		328			
GN_ESA								98			
GN_SAV		2	4		4	8		482			
GN_WBS		2	5		14	6		1514			
GN_EBS_NSW		9	22		12	6		3565			
GN_ET_WT		3	8		10			539			
GN_WA_WSA		2	5								
TR_CAS_ORO		3	8	26.2			18	18	100	2	2
TR_MAA_ORO											
TR_PED_ORO											
TR_SHH_ORO		14	34	14.4	31	65	69	126	54.8	3	3
TR_SPH_ORO		2	6	7.3	4		12	43	27.9	3	3
TR_TAS_E_DWS		13	31	35.1	37	43	63	47	134	6	6
TR_TAS_W_DWS		2	5	0.7	10	10	6	212	2.8	2	3
Unk		0	1		1	1		116			
Total	317	317	793	-	830	861	1367	35837	-	-	-

Table 2: 2019 estimated percentage of catch discarded, discard tonnage with CV, validity based on coverage (see Section 3.8 for details). Species without estimates had no observer data available. [1]

Species group	Disc %	Disc (t)	Disc CV %	Tot CV %	% Obs	Nshot obs	Catch % (>=5)	Shot % (>=5)	Valid?
Alfonsino	2.6	0.5	168.6	4.3	23	73	90	42	Fail
John Dory	10.2	5.1	76	7.8	4	185	98	98	Pass
King dory	5.7	5.9	218	12.3	9	134	95	80	Fail
Mirror Dory East	34.8	36.3	41.5	14.4	7	132	100	100	Pass
Mirror Dory West	9.3	3.5	56.2	5.2	16	92	100	100	Pass
Smooth Oreo Non-Cascade	0.4	0.2	504	2.1	13	5	78	76	Fail
Smooth Oreo Cascade									
Frostfish	70.7	530.2	179.8	127.2	19	84	89	89	Fail
Gemfish East	43	54	42.4	18.2	15	223	88	88	Pass
Gemfish GAB									
Gemfish West	8.8	8.1	46.3	4.1	9	59	100	98	Pass
Ocean Jackets	57	170.7	43.5	24.8	5	107	97	95	Pass
Latchetfish	44	127.9	24.2	10.7	6	276	94	94	Pass
Pink Ling East	8.8	36	35.7	3.1	7	196	100	100	Pass
Pink Ling West	1.2	4.4	22.3	0.3	10	187	93	96	Pass
Orange Roughy Cascade	8.2	1.6	325.4	26.7	5	6	62	61	Fail
Oreos	4	3.6	91.4	3.6	26	155	85	78	Pass
Orange Roughy GAB	73.6	8.5	508.8	374.7	10	2	0	0	Fail
Orange Roughy South	0	0		0	4	1	0	0	Fail
Orange Roughy West									
Royal Red Prawn	2.1	3	89	1.8	7	17	100	100	Pass
Ribaldo	13.5	15.9	239.4	32.4	14	147	87	89	Fail
Ocean Perch Inshore	91.4	68.5	42.3	38.7	39	106	93	83	Pass
Ocean Perch Offshore	15.9	27.6	27	4.3	7	167	97	94	Pass
Elephantfish	64.7	27.8	179.5	116.1	1	41	29	30	Fail
Gummy Shark	30.4	58	81.1	24.6	1	204	5	30	Fail
Deepwater Shark East	67.9	26.5	259	176	43	66	58	42	Fail
Deepwater Shark West	5.1	5.1	243	12.3	2	12	100	99	Fail
School Shark	32.2	17.9	45.8	14.7	2	94	19	18	Fail
Saw Shark	22.8	19.6	34.8	7.9	2	148	43	44	Fail
Squid	8.8	35.4	33.1	2.9	7	410	100	100	Pass
Blue eye Trevalla	3.8	6.2	98.8	3.7	8	73	55	75	Pass
Silver Trevally	34.2	0.6	153.4	52.5	24	18	52	61	Fail
Blue Warehou East	72.7	23.8	42.9	31.2	30	89	95	96	Pass
Blue Warehou West	66.5	14.7	205.4	136.7	21	19	100	99	Fail

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

Table 3: 2019 estimated percentage of catch discarded obtaioned using the Bergh method, discard tonnage with CV, validity based on coverage (see Section 3.8 for details). Species without estimates had no observer data available. [1]

Species group	Disc %	Disc (t)	Disc CV %	Tot CV %	% Obs	Nshot obs	Catch % (>=5)	Shot % (>=5)	Valid?
Deepwater Flathead									
Flathead	4.6	81.8	18.9	0.9	3	398	100	97	Pass
Blue Grenadier	10.7	860.4	20.3	2.2	10	403	100	96	Pass
Jackass Morwong East	32.2	55.5	38.9	12.5	6	162	100	98	Pass
Jackass Morwong West	8.4	2.1	95	7.9	12	32	41	68	Pass
Orange Roughy East	0.1	0.8	27.3	0	42	108	100	100	Pass
Bight Redfish									
Redfish	67.7	43.7	29.9	20.3	14	88	85	89	Pass
Silver Warehou	26.1	107.1	28.7	7.5	12	314	100	100	Pass
School Whiting	20.1	111.7	70.8	14.2	2	50	99	97	Pass

[1] ”Note that for these species groups, the discarded catch estimates used for assessment and management purposes are obtained from the relevant stock assessment model. These estimates, calculated using the Bergh method are presented for comparison purposes only.”

Table 4: Alfonsino: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	4.89	5	31	16.13	1895	1.94	0.05	0.18	0.04
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF	0.11		35		1573				
TR_TAS_BGS					580				
TR_TAS_E	1.83	20	71	28.17	2590	1.07	0.08	0.22	0.11
TR_TAS_ORO					27				
TR_TAS_W	0.92	29	23	126.09	1081	0.24	0.16	0.04	0.04
TR_BS_IN					40				
TR_ECDW	8.19	18	10	180	14	1.33	0.69	0.01	0
AL_CSA	0.09		6		1572				
AL_ESA	0.07		4		507				
AL_WBS_SAV	0.04		10		358				
AL_EBS_NSW	0.06		10		510				
AL_ET_WT	1.34	1	114	0.88	598	0	0.03	0	0
AL_WSA_WA	0.01		3		279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	17.55	73	0		33330			0.45	0.03

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

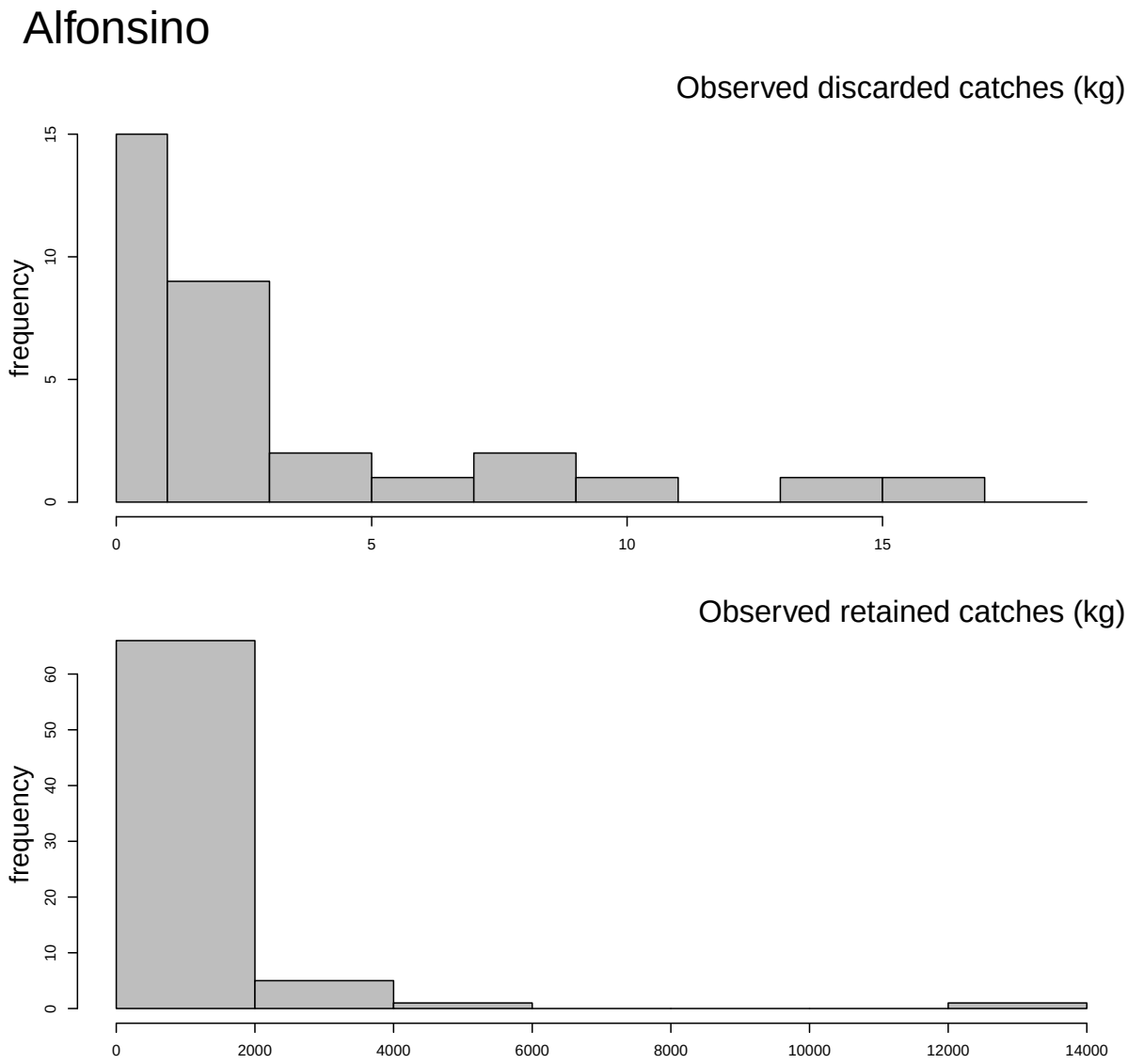

Figure 4.1: Histograms of observed discarded (top) and retained (bottom) catch weights for Alfonsino in 2019. For more information contact AFMA on (02) 6225 5555.

Table 5: Flathead: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	112.26	60	1454	4.13	1475	19.87	0.98	28.83	0.2
TR_NSW_OFF	12.74	6	108	5.56	597	0	0.32	0	0
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	2.81	33	40	82.5	1895	6.5	0.32	3.94	0.58
DS_EDL	795.78	106	8371	1.27	8867	3.44	0.93	28.34	0.03
TR_EDL_IN	466.02	90	3230	2.79	3341	4.68	1	15.62	0.03
TR_EDL_OFF	37.56	15	367	4.09	1573	6.64	0.35	3.65	0.09
TR_TAS_BGS					580				
TR_TAS_E	255.04	85	1658	5.13	2590	1.63	0.33	1.42	0.01
TR_TAS_ORO					27				
TR_TAS_W	3.39	3	34	8.82	1081	0	0.02	0	0
TR_BS_IN	0.92		31		40				
TR_ECDW	0.04		1		14				
AL_CSA	0.46		84		1572				
AL_ESA	0.02		7		507				
AL_WBS_SAV	0.07		26		358				
AL_EBS_NSW	0.34		17		510				
AL_ET_WT	0.06		23		598				
AL_WSA_WA					279				
GN_CSA	0.02		12		328				
GN_ESA	0		1		98				
GN_SAV	0		4		482				
GN_WBS	0.01		12		1514				
GN_EBS_NSW	0.12		95		3565				
GN_ET_WT	0.11		55		539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	1687.77	398	0		33330			81.8	0.05

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

Flathead

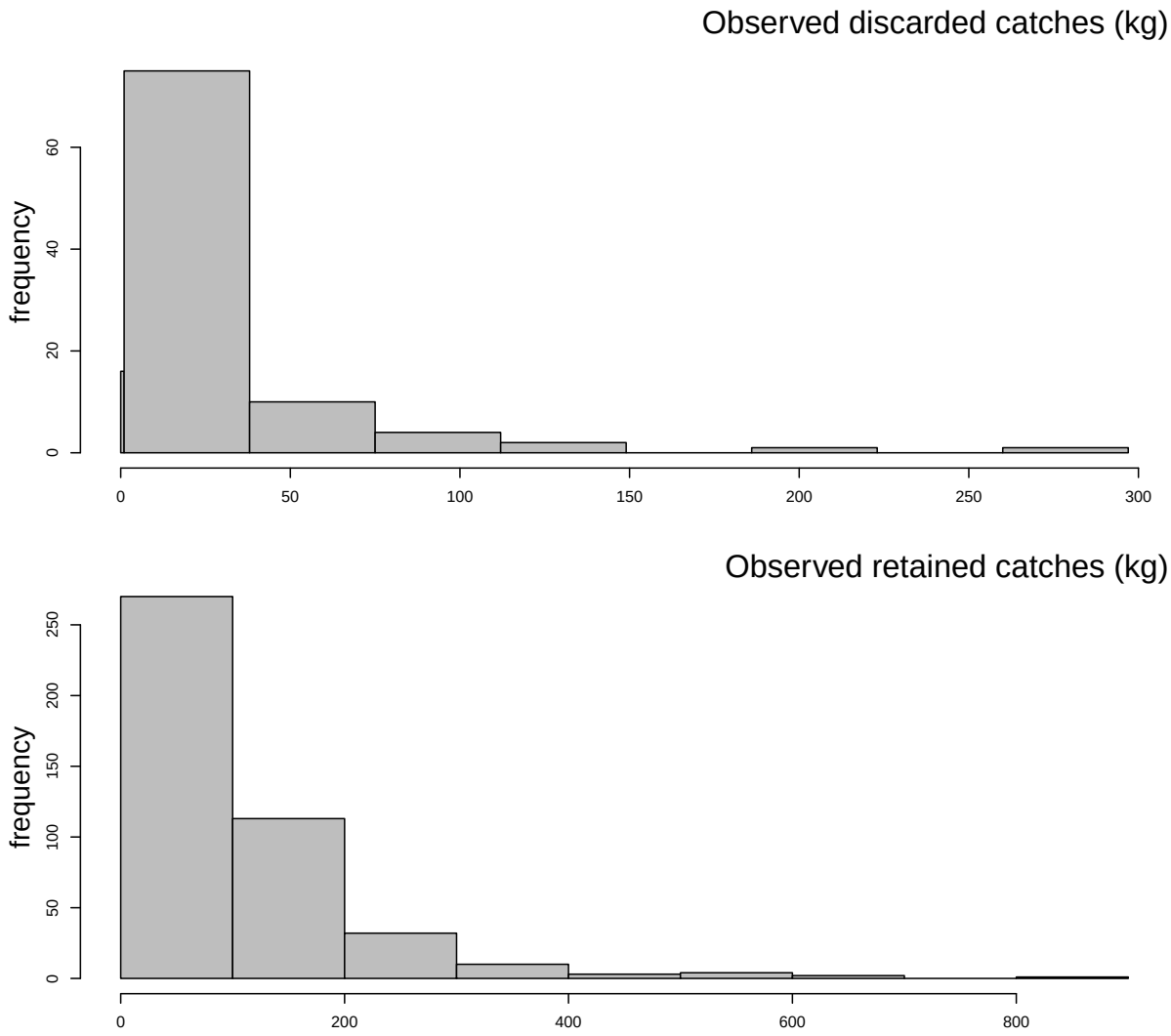

Figure 4.2: Histograms of observed discarded (top) and retained (bottom) catch weights for Flathead in 2019. For more information contact AFMA on (02) 6225 5555.

Table 6: Jackass Morwong East: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	1.47	17	74	22.97	1475	28.31	0.28	11.64	0.89
TR_NSW_OFF	0.2	1	3	33.33	597	46.1	0.05	1.45	0.88
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL	5.34	29	457	6.35	8867	8.36	0.25	18.85	0.78
TR_EDL_IN	46.22	47	1035	4.54	3341	10.66	0.52	18.6	0.29
TR_EDL_OFF	6.82	13	214	6.07	1573	5.44	0.3	2.59	0.28
TR_TAS_BGS					580				
TR_TAS_E	55.92	44	653	6.74	2590	5.25	0.17	2.36	0.04
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW	1.03	11	34	32.35	510	0	0.24	0	0
AL_ET_WT	0.23		36		598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW	0.02		9		3565				
GN_ET_WT	0.02		11		539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	117.27	162	0		33330			55.49	0.32

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

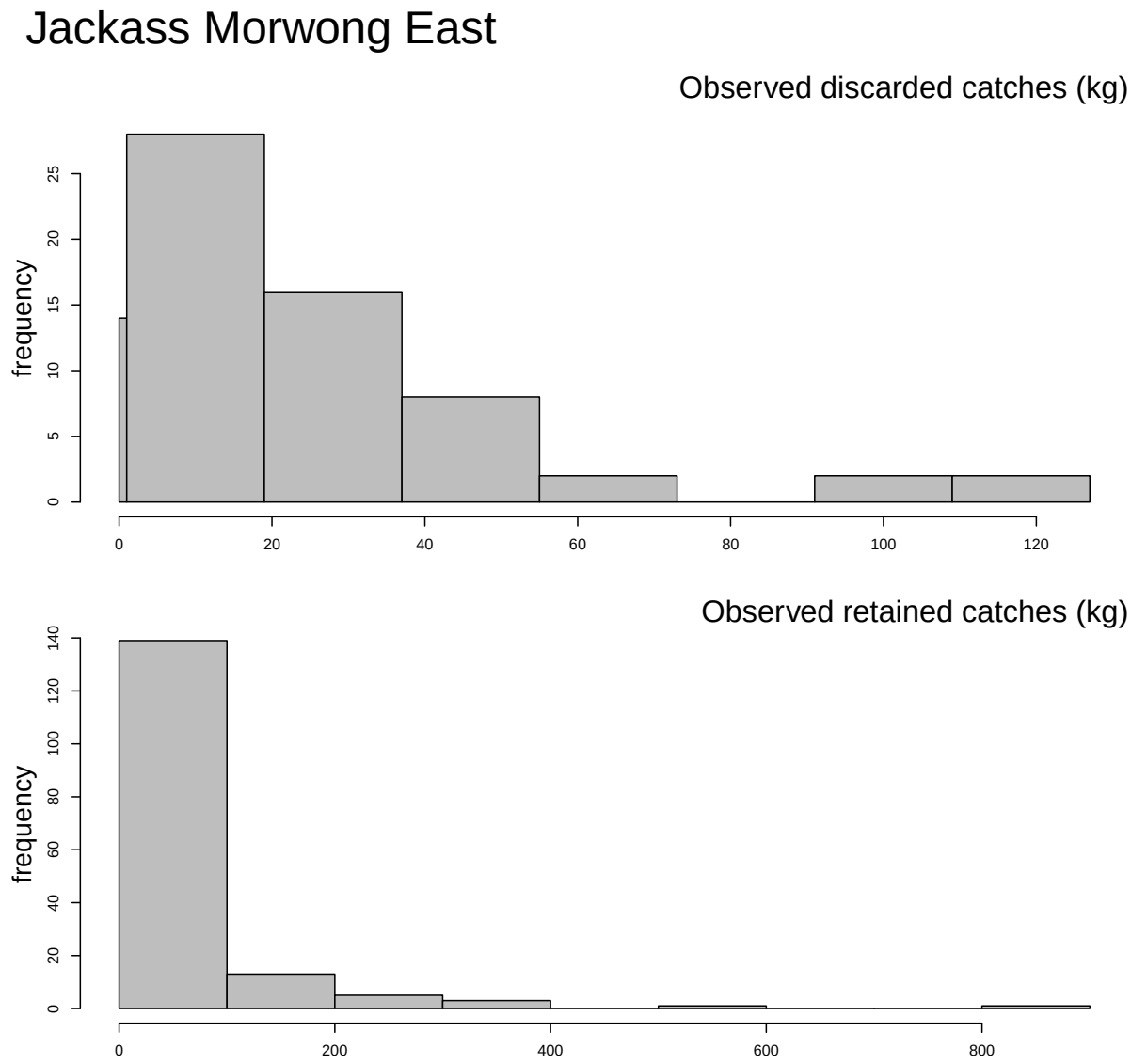

Figure 4.3: Histograms of observed discarded (top) and retained (bottom) catch weights for Jackass Morwong East in 2019. For more information contact AFMA on (02) 6225 5555.

Table 7: Jackass Morwong West: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	9.7	29	186	15.59	1895	4	0.28	2.13	0.18
DS_EDL	0.01		4		8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W	13.7	3	52	5.77	1081	0	0.02	0	0
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA	0.04		5		507				
AL_WBS_SAV	0.06		23		358				
AL_EBS_NSW					510				
AL_ET_WT	0		1		598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS	0.06		2		1514				
GN_EBS_NSW					3565				
GN_ET_WT	0.01		2		539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	23.58	32	0		33330			2.13	0.08

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

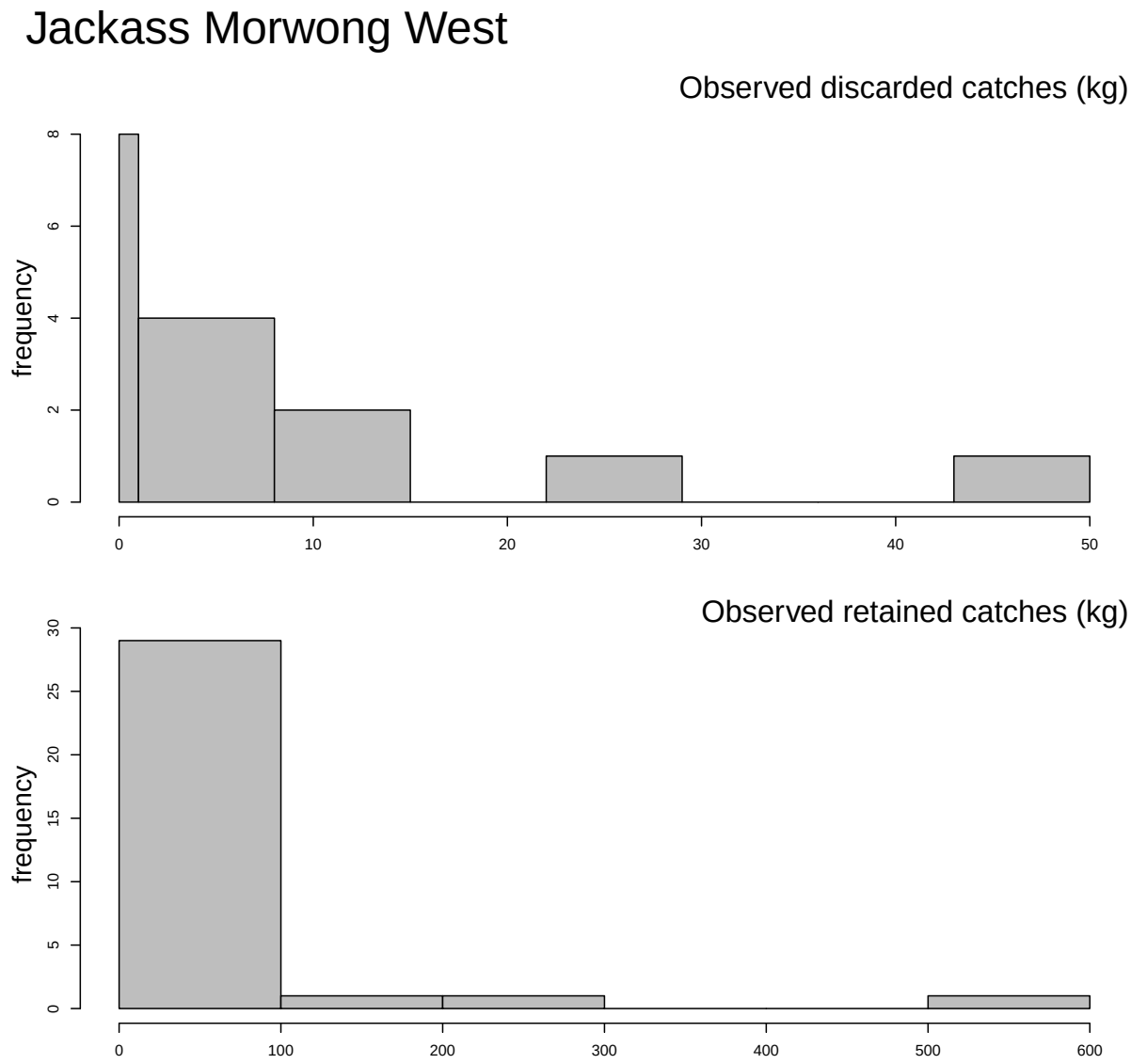

Figure 4.4: Histograms of observed discarded (top) and retained (bottom) catch weights for Jackass Morwong West in 2019. For more information contact AFMA on (02) 6225 5555.

Table 8: John Dory: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	4.31	44	449	9.8	1475	0.27	0.72	0.29	0.06
TR_NSW_OFF	0.2		31		597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	0.1		3		1895				
DS_EDL	13.17	61	2799	2.18	8867	0.89	0.54	4.22	0.24
TR_EDL_IN	24.35	66	1237	5.34	3341	0.09	0.73	0.22	0.01
TR_EDL_OFF	0.42	3	29	10.34	1573	3	0.07	0.33	0.44
TR_TAS_BGS					580				
TR_TAS_E	2.76	11	156	7.05	2590	0.75	0.04	0.08	0.03
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN	0.07		7		40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS	0.01		9		1514				
GN_EBS_NSW	0.03		26		3565				
GN_ET_WT	0		2		539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	45.42	185	0		33330			5.14	0.1

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

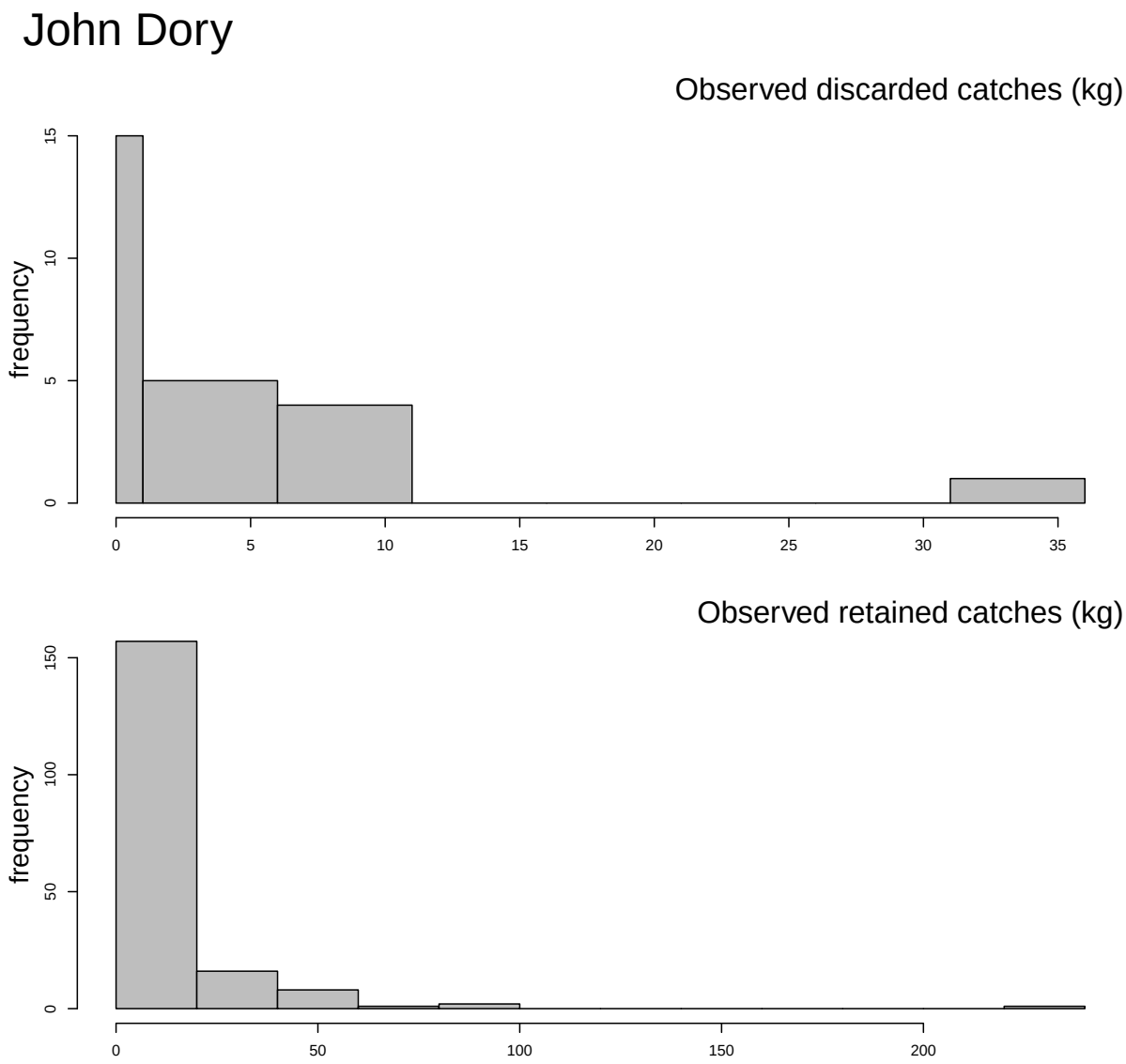

Figure 4.5: Histograms of observed discarded (top) and retained (bottom) catch weights for John Dory in 2019. For more information contact AFMA on (02) 6225 5555.

Table 9: Redfish: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	14.12	46	311	14.79	1475	29.64	0.75	32.97	0.7
TR_NSW_OFF	2.09	3	26	11.54	597	47.81	0.16	4.51	0.68
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	0.77		6		1895				
DS_EDL	0.36	4	28	14.29	8867	1.28	0.04	0.4	0.53
TR_EDL_IN	3.28	24	214	11.21	3341	4.22	0.27	3.76	0.53
TR_EDL_OFF	0.99	11	30	36.67	1573	5.26	0.26	2.12	0.68
TR_TAS_BGS					580				
TR_TAS_E	0.03		1		2590				
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA	0		4		1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW	0		2		510				
AL_ET_WT	0.01		1		598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW	0		1		3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	21.65	88	0		33330			43.76	0.68

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

Redfish

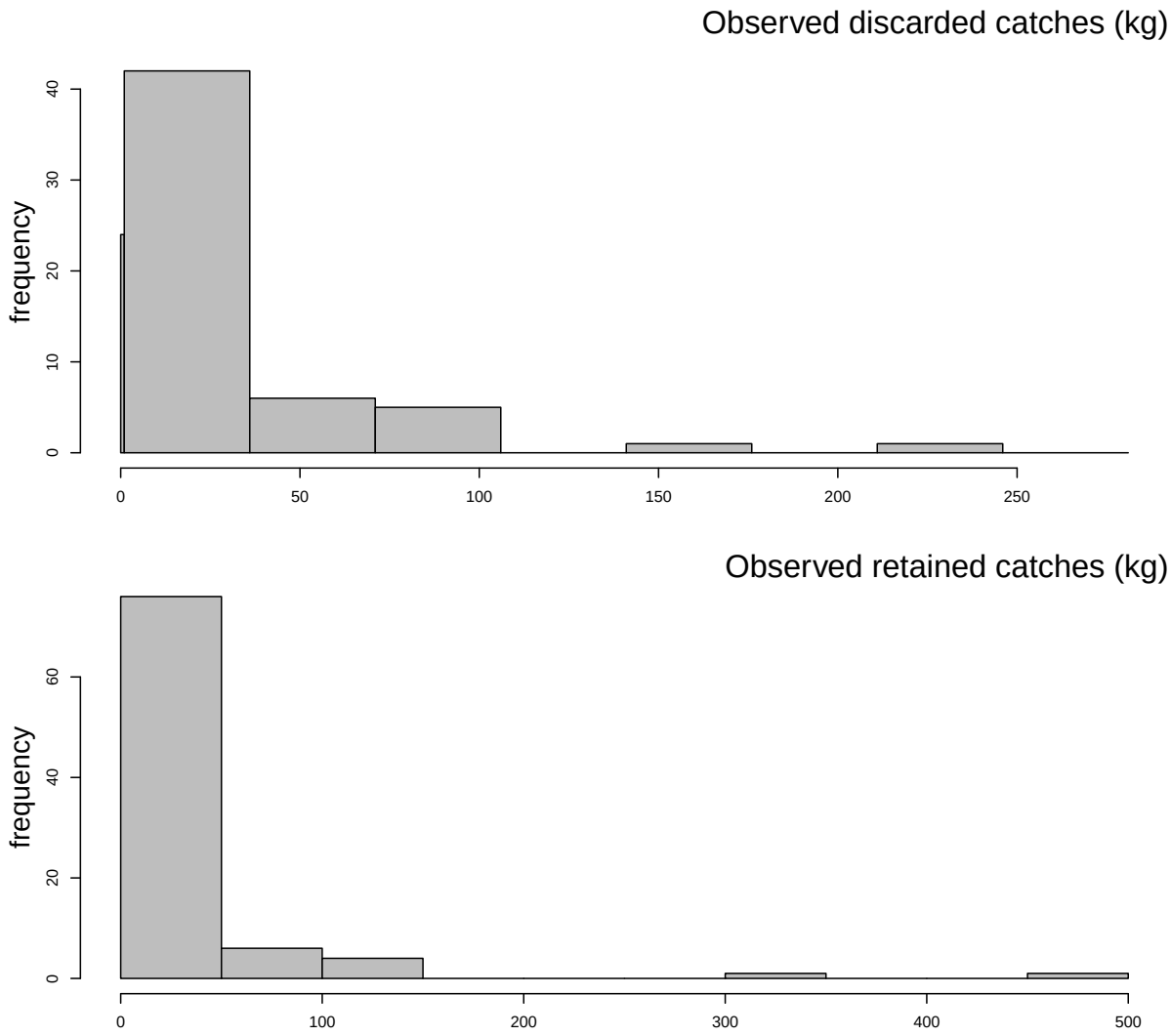

Figure 4.6: Histograms of observed discarded (top) and retained (bottom) catch weights for Redfish in 2019. For more information contact AFMA on (02) 6225 5555.

Table 10: Royal Red Prawn: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF	0.92	5	39	12.82	597	4.76	0.26	0.75	0.45
TR_NSW_RRP	141.58	5	201	2.49	201	0.99	1	0.2	0
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF	0.6	7	6	116.67	1573	8.07	0.16	2.07	0.78
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	143.1	17	0		33330			3.02	0.02

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

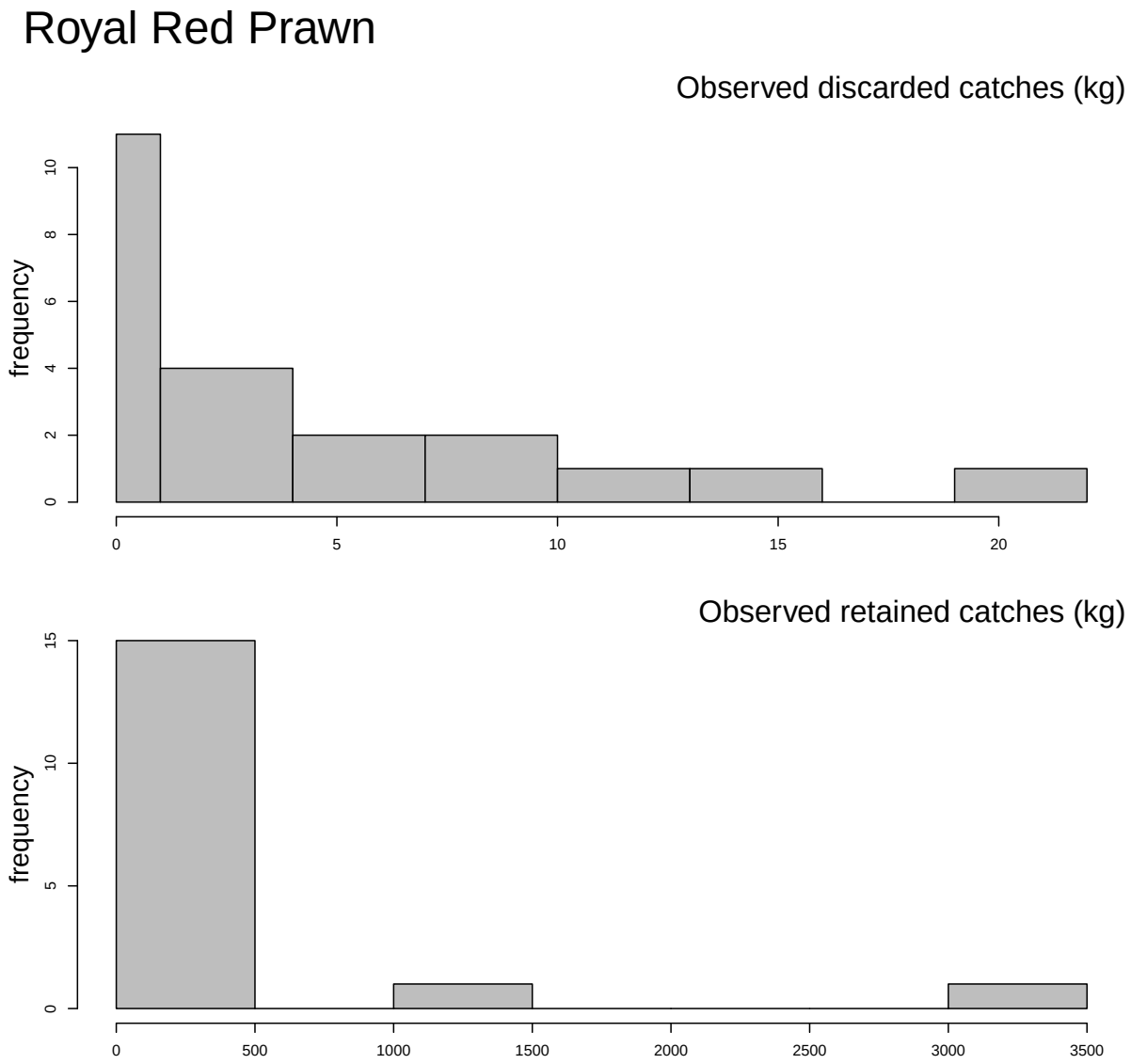

Figure 4.7: Histograms of observed discarded (top) and retained (bottom) catch weights for Royal Red Prawn in 2019. For more information contact AFMA on (02) 6225 5555.

Table 11: School Whiting: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	27.8	7	317	2.21	1475	0.47	0.11	0.08	0
TR_NSW_OFF	0.77		22		597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	0.03		1		1895				
DS_EDL	417.21	43	2905	1.48	8867	33.36	0.38	111.59	0.21
TR_EDL_IN	0.34		29		3341				
TR_EDL_OFF	0.26		6		1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN	3.06		26		40				
TR_ECDW	0.12		1		14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	449.59	50	0		33330			111.67	0.2

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

School Whiting

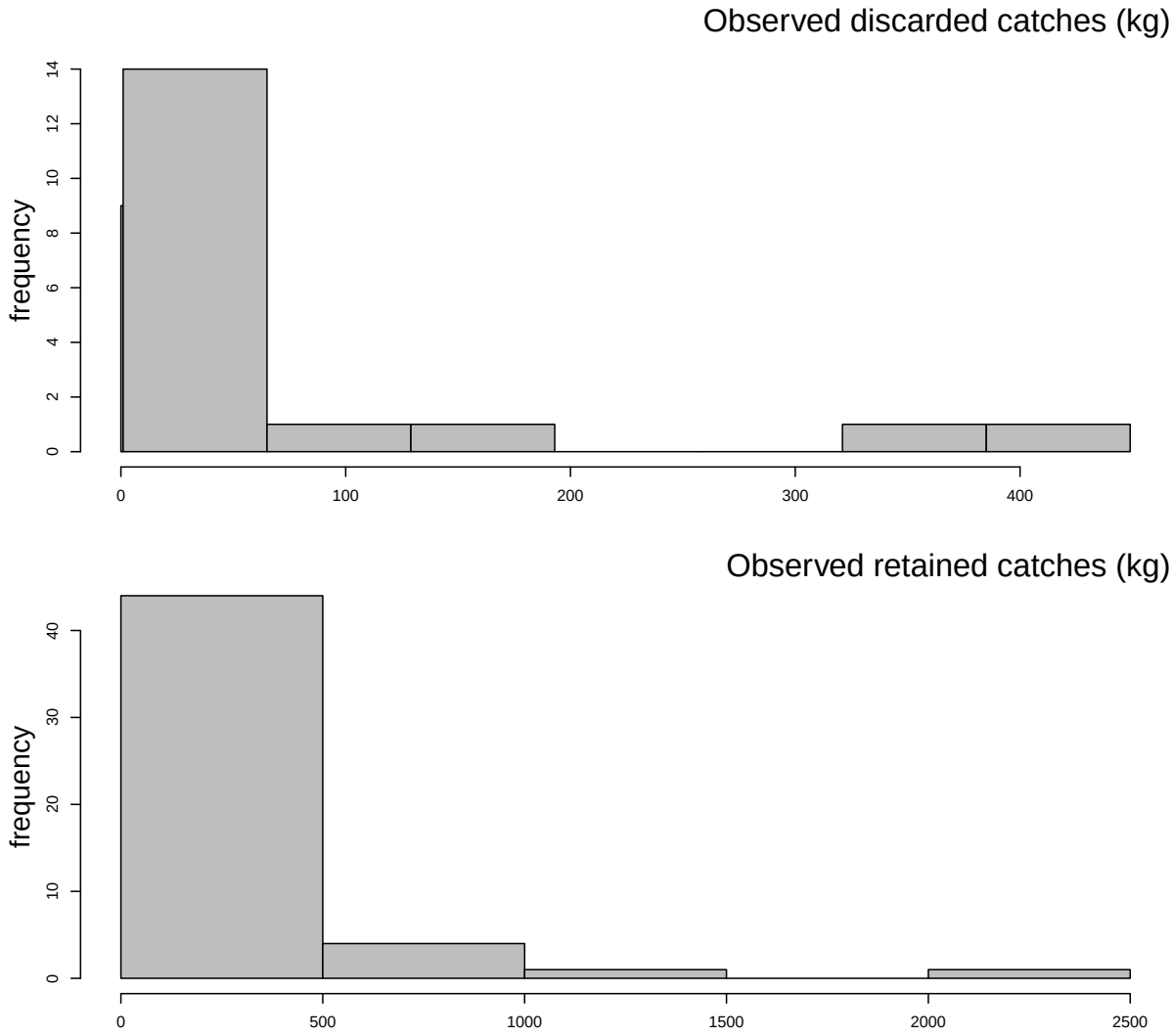

Figure 4.8: Histograms of observed discarded (top) and retained (bottom) catch weights for School Whiting in 2019. For more information contact AFMA on (02) 6225 5555.

Table 12: Silver Trevally: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	1.21	10	36	27.78	1475	0.1	0.16	0.02	0.02
TR_NSW_OFF	0		1		597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	0.38		7		1895				
DS_EDL	0.01	8	10	80	8867	0.98	0.07	0.61	0.98
TR_EDL_IN	0.69		11		3341				
TR_EDL_OFF	0.02		3		1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT	0.01		4		598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV	0		1		482				
GN_WBS	0		1		1514				
GN_EBS_NSW	0		2		3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	2.32	18	0		33330			0.63	0.34

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

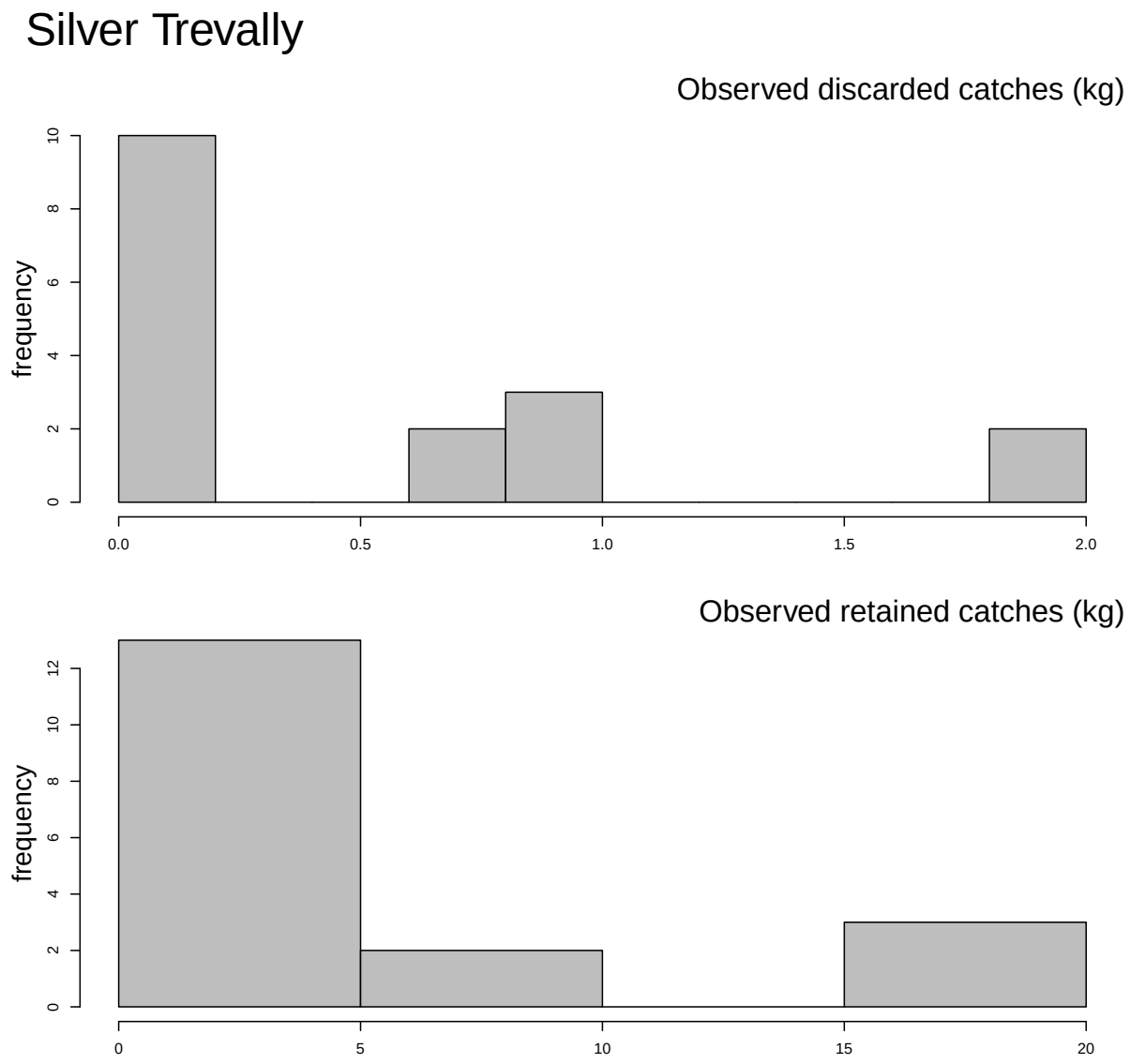

Figure 4.9: Histograms of observed discarded (top) and retained (bottom) catch weights for Silver Trevally in 2019. For more information contact AFMA on (02) 6225 5555.

Table 13: Ocean Jackets: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	65	51	813	6.27	1475	96.12	0.84	118.53	0.65
TR_NSW_OFF	1.03	4	25	16	597	1.85	0.21	0.23	0.18
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	1.32	6	34	17.65	1895	14.23	0.06	1.57	0.54
DS_EDL	2	7	147	4.76	8867	6.9	0.06	3.76	0.65
TR_EDL_IN	57.49	36	905	3.98	3341	34.8	0.4	46.51	0.45
TR_EDL_OFF	1.73	1	18	5.56	1573	2	0.02	0.07	0.04
TR_TAS_BGS					580				
TR_TAS_E	0.14	2	19	10.53	2590	0.36	0.01	0.01	0.07
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN	0.09		1		40				
TR_ECDW					14				
AL_CSA	0.01		6		1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA	0.01		3		328				
GN_ESA					98				
GN_SAV	0		1		482				
GN_WBS	0		3		1514				
GN_EBS_NSW	0.01		5		3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	128.83	107	0		33330			170.68	0.57

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

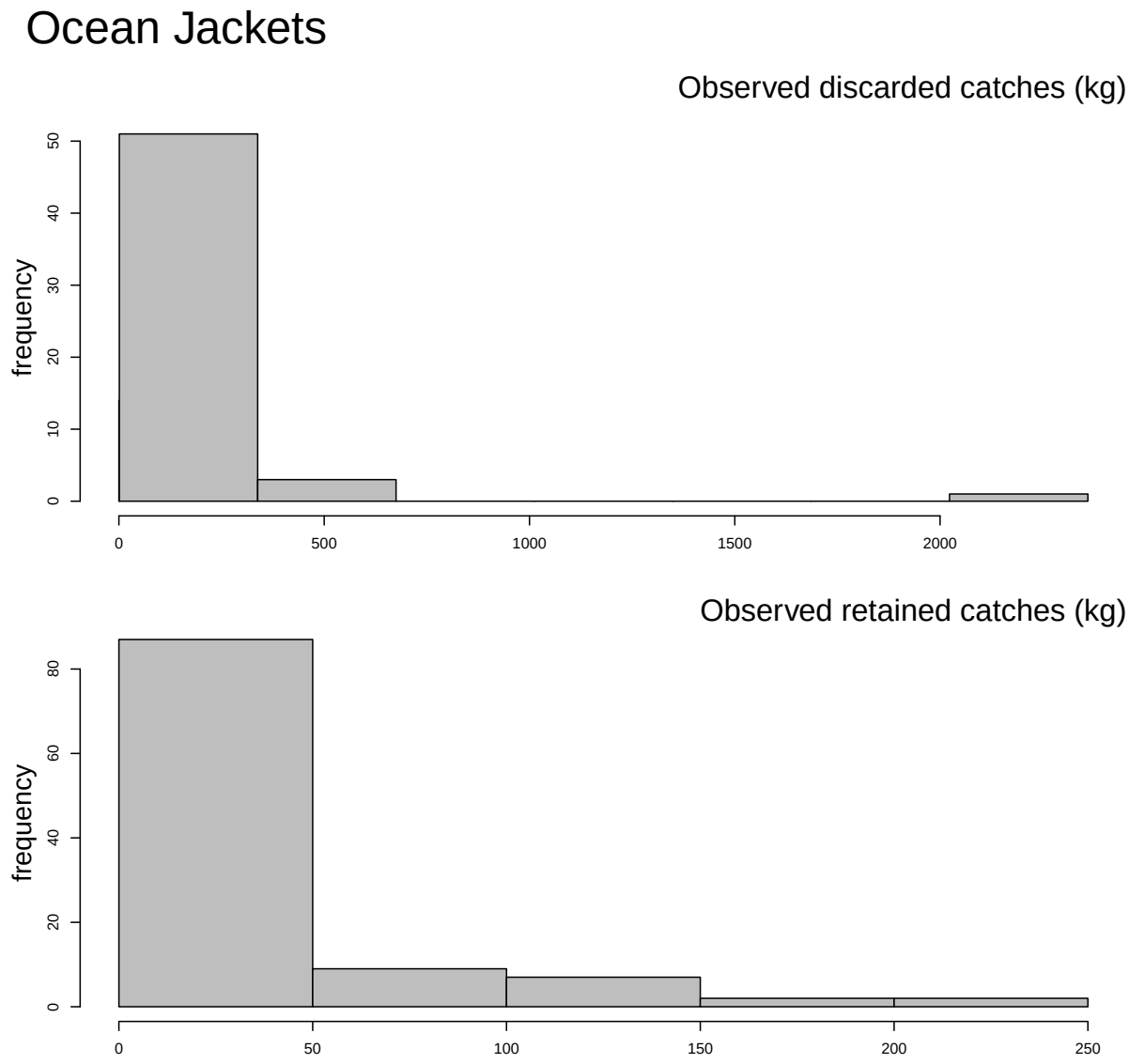

Figure 4.10: Histograms of observed discarded (top) and retained (bottom) catch weights for Ocean Jackets in 2019. For more information contact AFMA on (02) 6225 5555.

Table 14: Frostfish: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF	20.42	3	39	7.69	597	23.4	0.16	2.21	0.1
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	18.05	13	129	10.08	1895	15.35	0.13	3.67	0.17
DS_EDL	0.55		2		8867				
TR_EDL_IN	3.59	2	8	25	3341	0	0.02	0	0
TR_EDL_OFF	59.96	12	82	14.63	1573	1175.73	0.28	516.77	0.9
TR_TAS_BGS					580				
TR_TAS_E	111.53	9	163	5.52	2590	75.62	0.04	6.94	0.06
TR_TAS_ORO					27				
TR_TAS_W	5.75	45	23	195.65	1081	2.4	0.25	0.64	0.1
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	219.85	84	0		33330			530.23	0.71

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

Frostfish

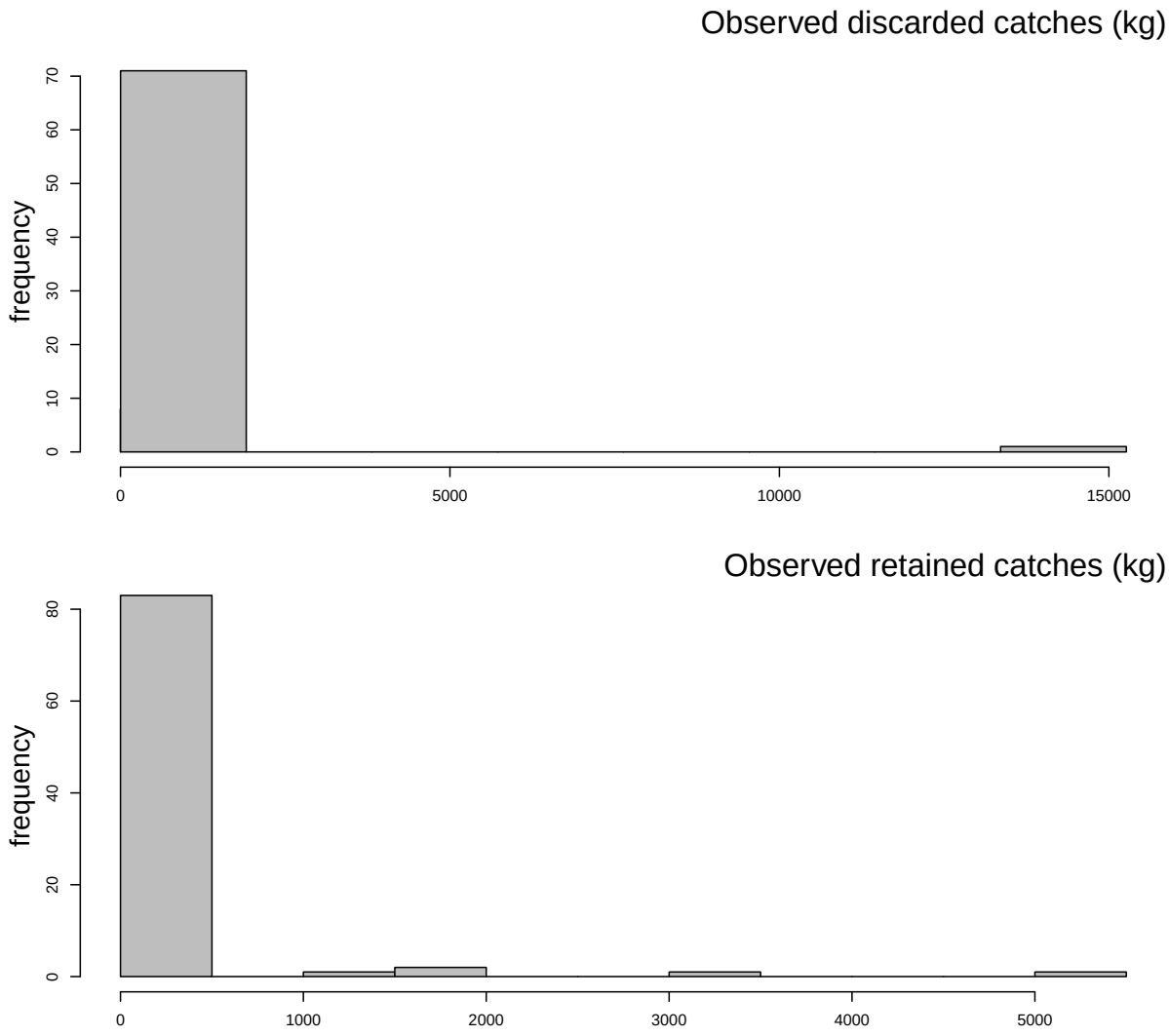

Figure 4.11: Histograms of observed discarded (top) and retained (bottom) catch weights for Frostfish in 2019. For more information contact AFMA on (02) 6225 5555.

Table 15: King dory: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	0	1	1	100	1475	0	0.02	0	NaN
TR_NSW_OFF	0.09	2	10	20	597	0.48	0.11	0.03	0.25
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	50.07	41	409	10.02	1895	4.29	0.4	3.23	0.06
DS_EDL	0.02		3		8867				
TR_EDL_IN	0.28	2	15	13.33	3341	21.12	0.02	1.57	0.85
TR_EDL_OFF	4.09	4	258	1.55	1573	0	0.09	0	0
TR_TAS_BGS					580				
TR_TAS_E	6.99	30	223	13.45	2590	0.94	0.12	0.29	0.04
TR_TAS_ORO					27				
TR_TAS_W	37.57	54	511	10.57	1081	2.58	0.3	0.83	0.02
TR_BS_IN	0		1		40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW	0		3		3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	99.11	134	0		33330			5.95	0.06

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

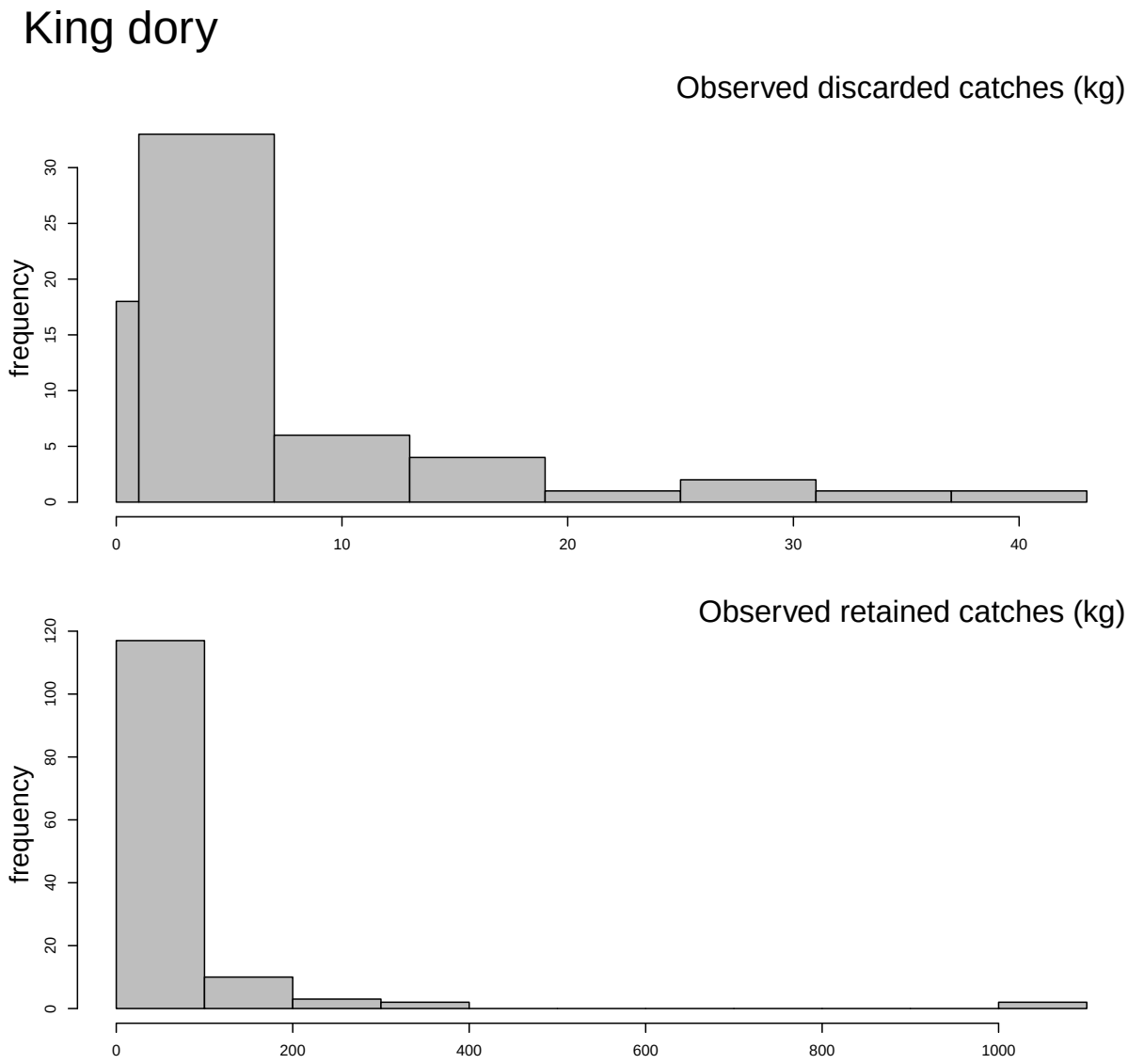

Figure 4.12: Histograms of observed discarded (top) and retained (bottom) catch weights for King dory in 2019. For more information contact AFMA on (02) 6225 5555.

Table 16: Latchetfish: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	30.12	37	598	6.19	1475	27.85	0.61	24.91	0.45
TR_NSW_OFF	1.99	6	53	11.32	597	2.97	0.32	0.56	0.22
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	47.4	38	391	9.72	1895	44.49	0.37	31.11	0.4
DS_EDL	14.76	34	1202	2.83	8867	5.26	0.3	13.91	0.49
TR_EDL_IN	26.25	70	1132	6.18	3341	7.68	0.78	19.95	0.43
TR_EDL_OFF	5.42	16	233	6.87	1573	9.15	0.37	5.36	0.5
TR_TAS_BGS					580				
TR_TAS_E	27.75	72	719	10.01	2590	43.34	0.28	31.82	0.53
TR_TAS_ORO					27				
TR_TAS_W	8.79	3	65	4.62	1081	16	0.02	0.29	0.03
TR_BS_IN					40				
TR_ECDW	0.06		1		14				
AL_CSA	0.03		15		1572				
AL_ESA	0.01		5		507				
AL_WBS_SAV	0.15		32		358				
AL_EBS_NSW					510				
AL_ET_WT	0.18		40		598				
AL_WSA_WA	0.08		16		279				
GN_CSA					328				
GN_ESA	0.03		7		98				
GN_SAV	0.04		16		482				
GN_WBS	0.04		26		1514				
GN_EBS_NSW	0.03		21		3565				
GN_ET_WT	0.11		37		539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	163.24	276	0		33330			127.91	0.44

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

Latchetfish

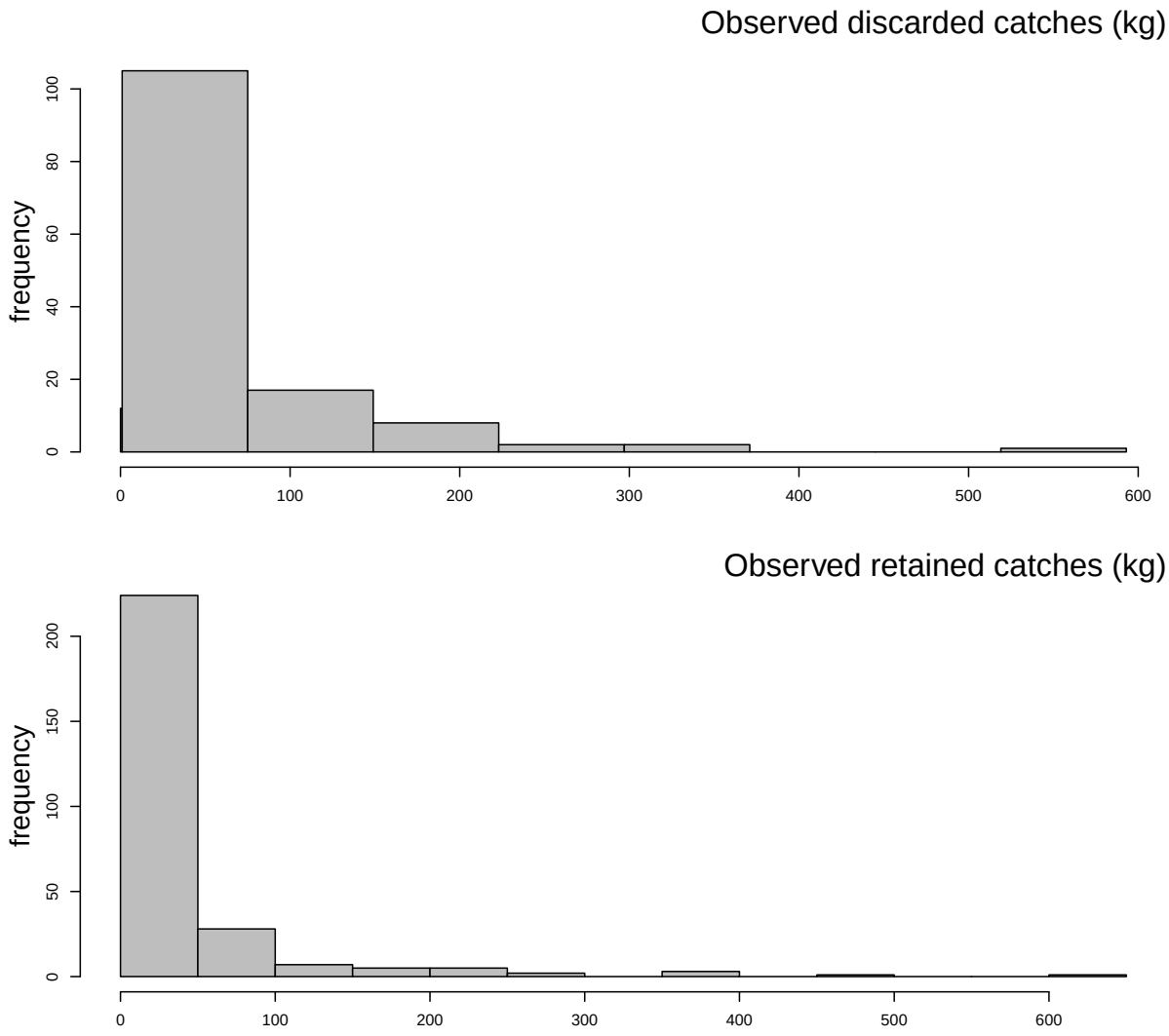

Figure 4.13: Histograms of observed discarded (top) and retained (bottom) catch weights for Latchetfish in 2019. For more information contact AFMA on (02) 6225 5555.

Table 17: Squid: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	10.51	38	351	10.83	1475	3.84	0.62	3.53	0.25
TR_NSW_OFF	8.06	14	193	7.25	597	5.47	0.74	2.41	0.23
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	120.46	71	1191	5.96	1895	1.58	0.69	2.07	0.02
DS_EDL	5.81	40	1033	3.87	8867	0	0.35	0	0
TR_EDL_IN	35.79	63	1167	5.4	3341	2.24	0.7	5.24	0.13
TR_EDL_OFF	83.14	28	709	3.95	1573	16.12	0.65	16.53	0.17
TR_TAS_BGS					580				
TR_TAS_E	96.14	98	1097	8.93	2590	3.21	0.39	3.21	0.03
TR_TAS_ORO					27				
TR_TAS_W	6.91	58	232	25	1081	6.94	0.32	2.39	0.26
TR_BS_IN	0.03		1		40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	366.85	410	0		33330			35.38	0.09

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

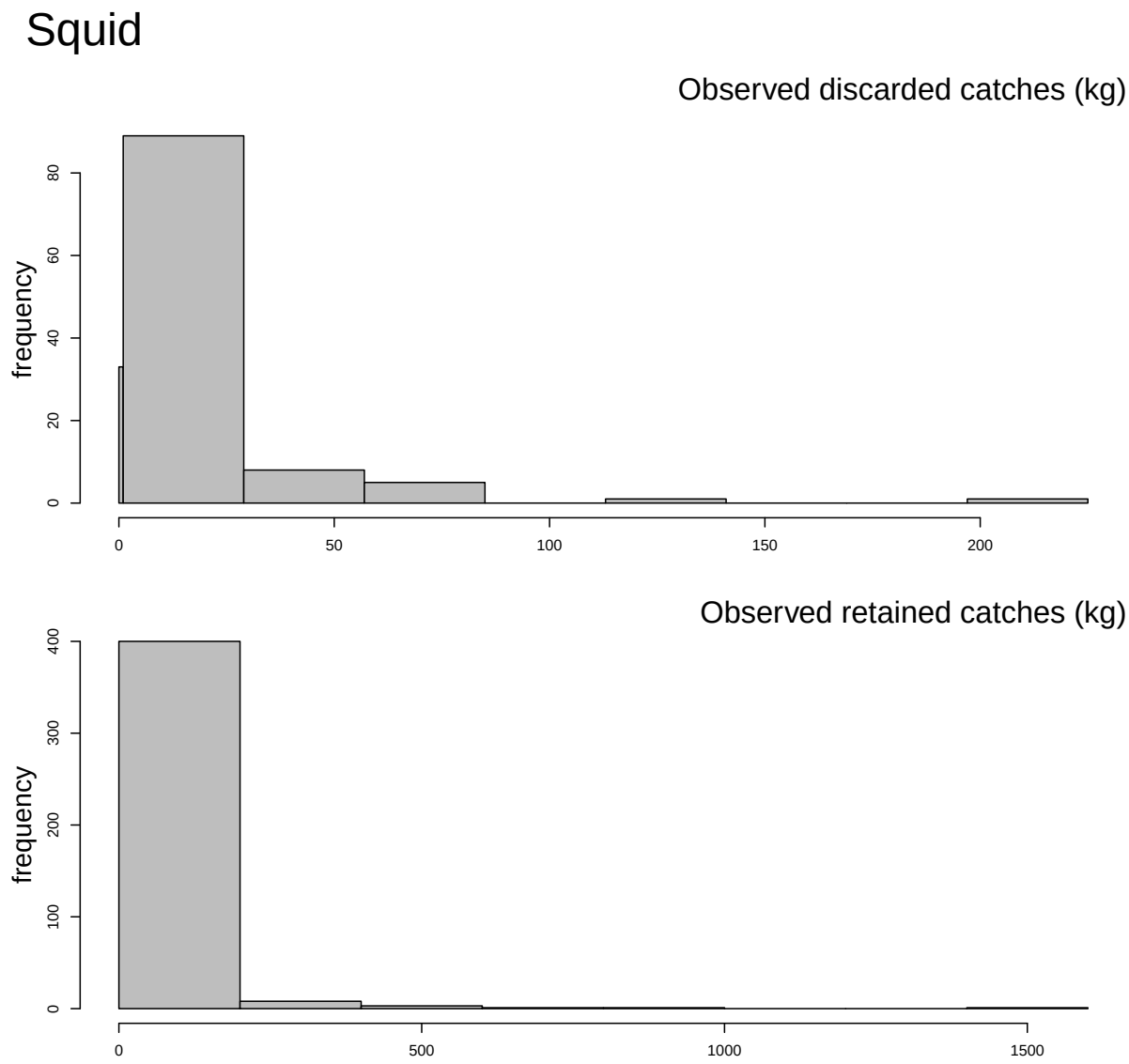

Figure 4.14: Histograms of observed discarded (top) and retained (bottom) catch weights for Squid in 2019. For more information contact AFMA on (02) 6225 5555.

Table 18: Blue eye Trevalla: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF	0.11		5		597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	8.13	8	113	7.08	1895	0	0.08	0	0
DS_EDL					8867				
TR_EDL_IN	0.01		2		3341				
TR_EDL_OFF	0.29	1	29	3.45	1573	0	0.02	0	0
TR_TAS_BGS					580				
TR_TAS_E	13.47	11	87	12.64	2590	0	0.04	0	0
TR_TAS_ORO					27				
TR_TAS_W	1.08	8	75	10.67	1081	2	0.04	0.1	0.08
TR_BS_IN					40				
TR_ECDW	2.25	8	8	100	14	2	0.31	0.01	0
AL_CSA	28.3		36		1572				
AL_ESA	7.83		35		507				
AL_WBS_SAV	20.35		78		358				
AL_EBS_NSW	26.71	9	137	6.57	510	0	0.2	0	0
AL_ET_WT	105.32	28	238	11.76	598	11.28	0.9	6.09	0.05
AL_WSA_WA	71.5		36		279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	285.35	73	0		33330			6.2	0.04

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

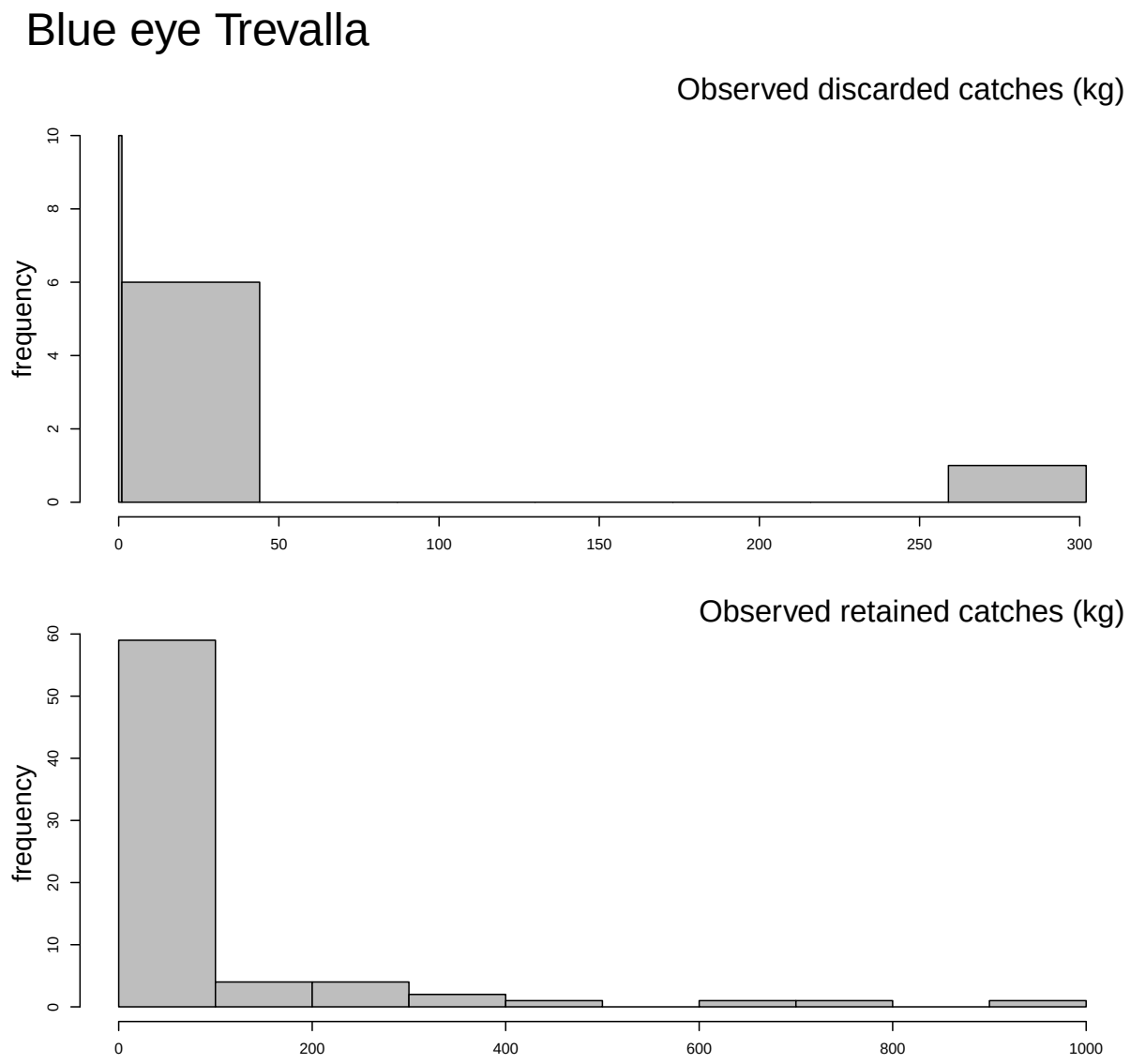

Figure 4.15: Histograms of observed discarded (top) and retained (bottom) catch weights for Blue eye Trevalla in 2019. For more information contact AFMA on (02) 6225 5555.

Table 19: Blue Grenadier: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	0.02		3		1475				
TR_NSW_OFF	0.82	1	24	4.17	597	0	0.05	0	0
TR_NSW_RRP					201				
TR_SW_BGS	53.7	21	157	13.38	157	30.42	1	4.78	0.08
TR_SW_ORO									
TR_SW	456.8	54	1007	5.36	1895	22.63	0.52	22.48	0.05
DS_EDL					8867				
TR_EDL_IN	1.1	1	34	2.94	3341	0	0.01	0	0
TR_EDL_OFF	220.27	23	693	3.32	1573	202.57	0.53	170.65	0.44
TR_TAS_BGS	5801.02	186	580	32.07	580	933.89	1	541.66	0.09
TR_TAS_E	336.97	49	547	8.96	2590	84.48	0.19	42.21	0.11
TR_TAS_ORO					27				
TR_TAS_W	335.78	42	544	7.72	1081	312.76	0.23	78.02	0.19
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA	0.07		21		1572				
AL_ESA	0.02		7		507				
AL_WBS_SAV	0.14		17		358				
AL_EBS_NSW	0.28	1	24	4.17	510	0	0.02	0	0
AL_ET_WT	3.89	25	182	13.74	598	1.35	0.81	0.65	0.14
AL_WSA_WA	0.08		11		279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	7210.96	403	0		33330			860.45	0.11

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

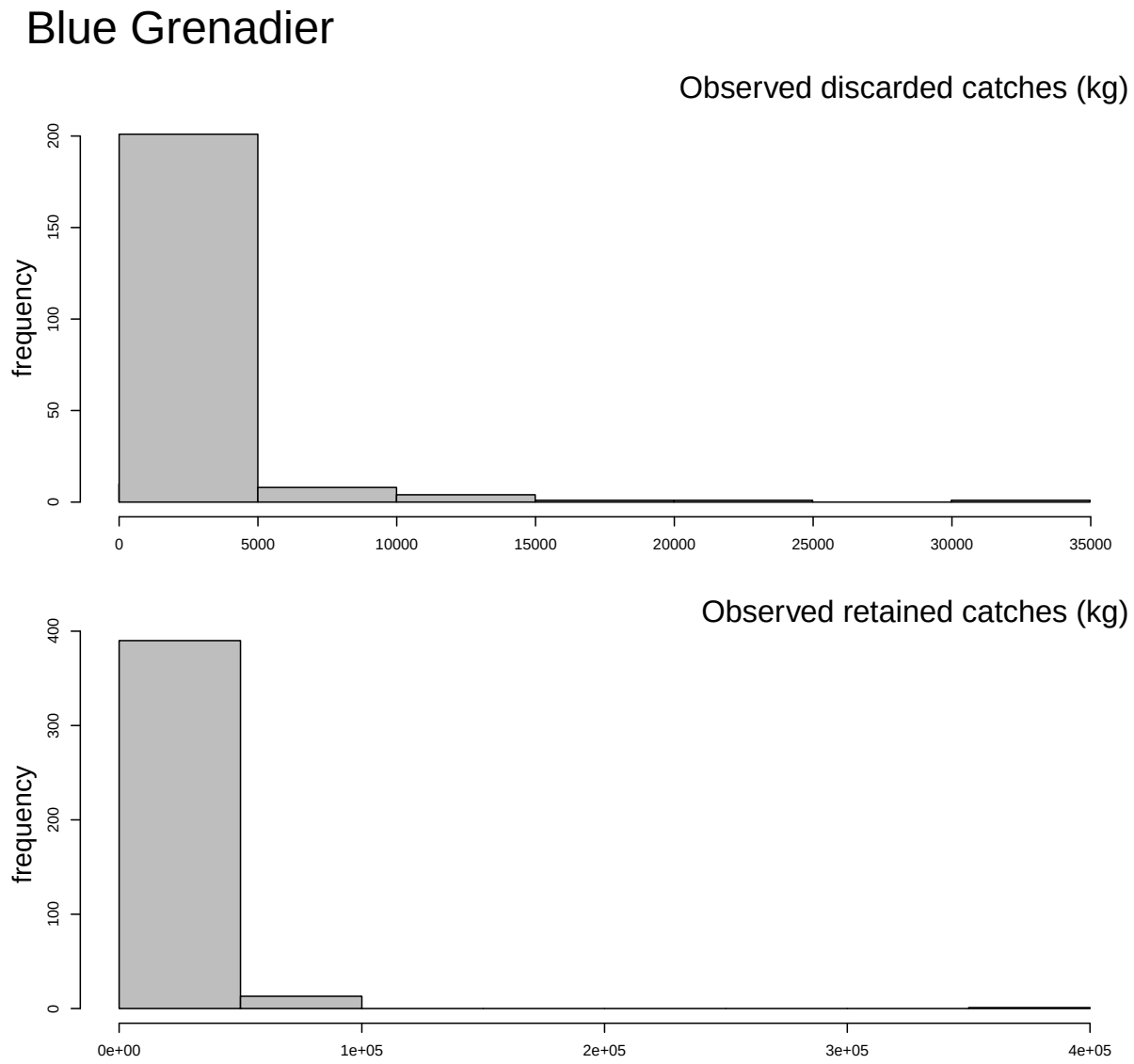

Figure 4.16: Histograms of observed discarded (top) and retained (bottom) catch weights for Blue Grenadier in 2019. For more information contact AFMA on (02) 6225 5555.

Table 20: Blue Warehou East: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	0.83	16	12	133.33	1475	6.38	0.26	2.47	0.75
TR_NSW_OFF	0.03		2		597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL	1.13	28	111	25.23	8867	8.72	0.25	18.98	0.94
TR_EDL_IN	0.25	13	45	28.89	3341	2.7	0.14	1.31	0.84
TR_EDL_OFF	0.01	5	6	83.33	1573	3.92	0.12	0.72	0.99
TR_TAS_BGS					580				
TR_TAS_E	6.71	27	110	24.55	2590	1.05	0.11	0.29	0.04
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN	0.05		3		40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW	0.37		6		3565				
GN_ET_WT	0		1		539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	9.38	89	0		33330			23.77	0.73

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

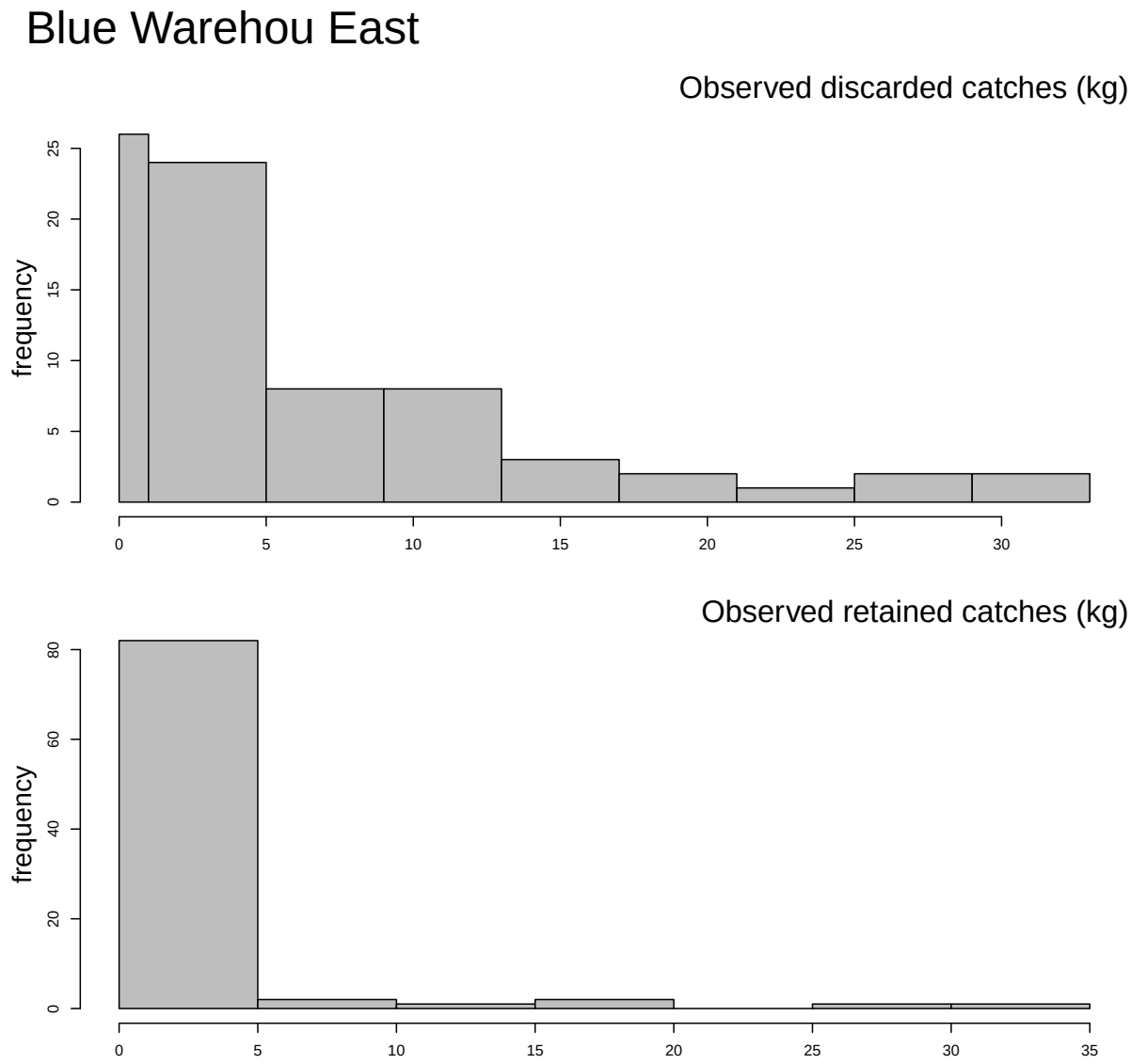

Figure 4.17: Histograms of observed discarded (top) and retained (bottom) catch weights for Blue Warehou East in 2019. For more information contact AFMA on (02) 6225 5555.

Table 21: Blue Warehou West: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	7.28	13	82	15.85	1895	61.61	0.13	14.74	0.67
DS_EDL	0		1		8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W	0.13	6	6	100	1081	0	0.03	0	0
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	7.41	19	0		33330			14.74	0.67

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

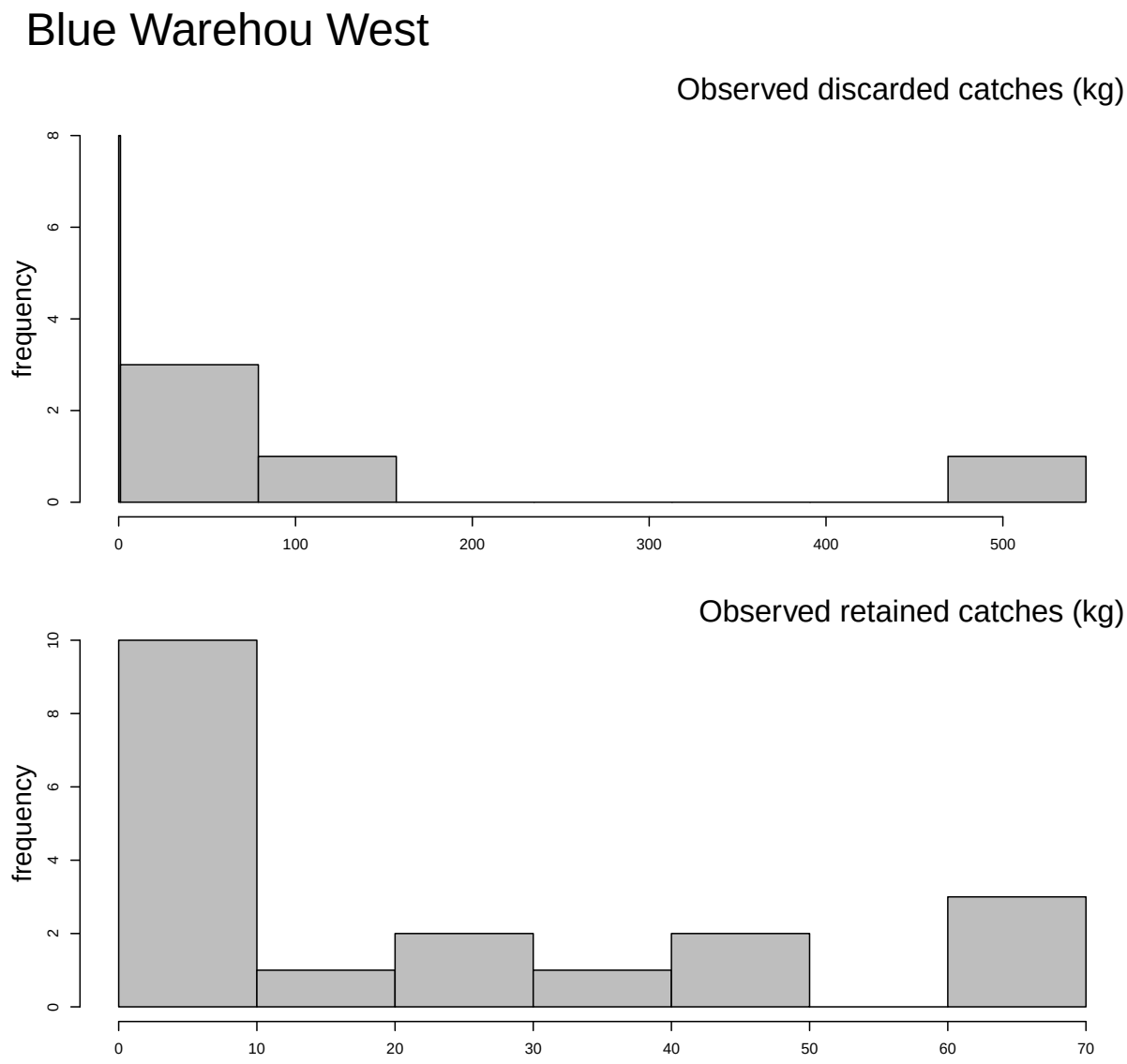

Figure 4.18: Histograms of observed discarded (top) and retained (bottom) catch weights for Blue Warehou West in 2019. For more information contact AFMA on (02) 6225 5555.

Table 22: Gemfish East: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM	6.19	6	96	6.25	96	64.28	1	6.17	0.5
TR_NSW_IN	1.09	19	20	95	1475	22.94	0.31	10.54	0.91
TR_NSW_OFF	1.8	6	29	20.69	597	1.2	0.32	0.23	0.11
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL	0.01	7	1	700	8867	21.46	0.06	11.68	1
TR_EDL_IN	1.52	8	94	8.51	3341	6.48	0.09	1.93	0.56
TR_EDL_OFF	12.97	25	427	5.85	1573	17.12	0.58	15.68	0.55
TR_TAS_BGS					580				
TR_TAS_E	23.72	53	308	17.21	2590	4.95	0.21	2.67	0.1
TR_TAS_ORO					27				
TR_TAS_W	15.72	96	342	28.07	1081	8.99	0.53	5.13	0.25
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW	0.15		10		510				
AL_ET_WT	8.67	3	170	1.76	598	0	0.1	0	0
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	71.84	223	0		33330			54.03	0.43

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

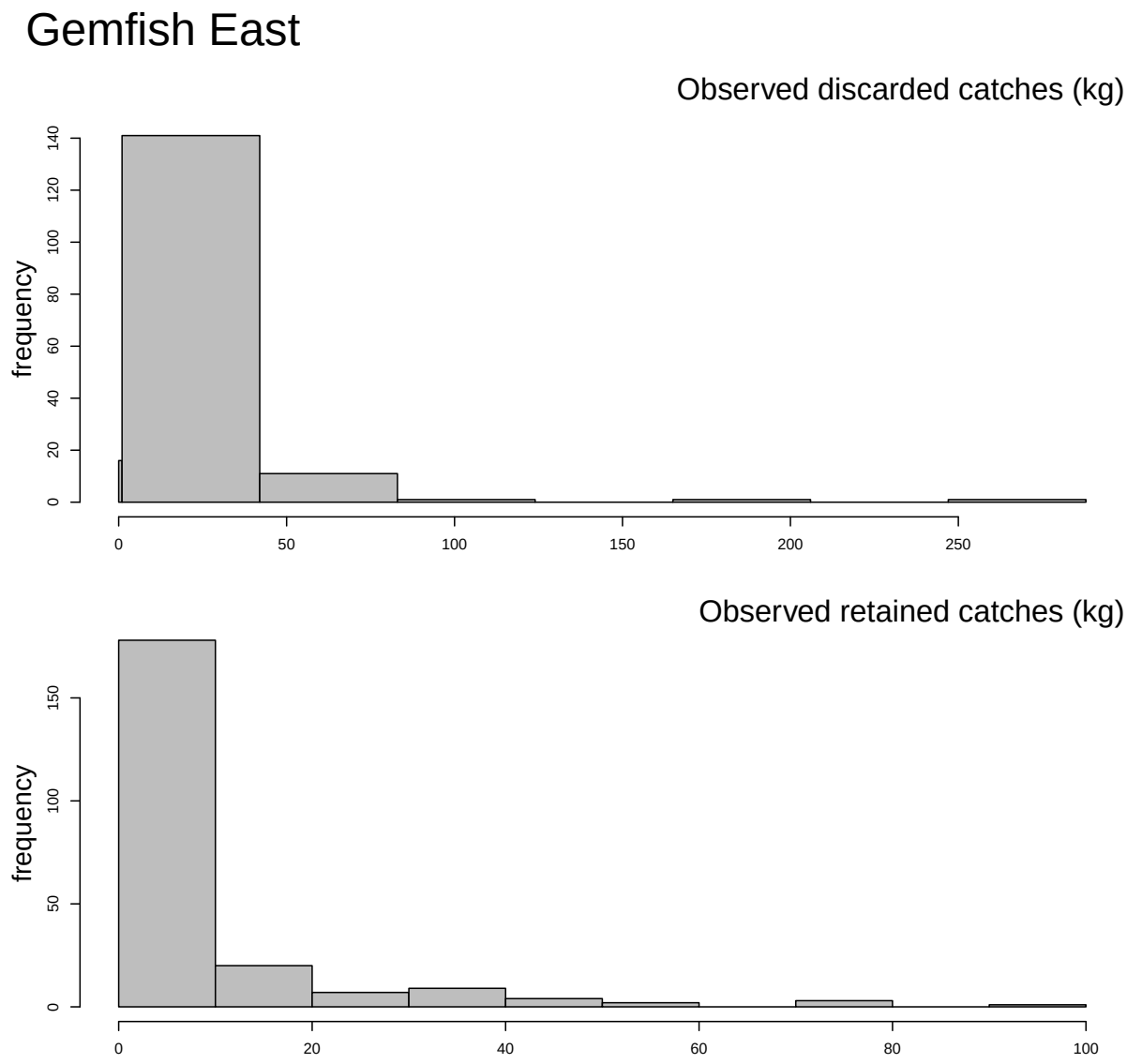

Figure 4.19: Histograms of observed discarded (top) and retained (bottom) catch weights for Gemfish East in 2019. For more information contact AFMA on (02) 6225 5555.

Table 23: Gemfish West: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	83.57	59	665	8.87	1895	7.43	0.57	8.06	0.09
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA	0		1		1572				
AL_ESA	0.02		2		507				
AL_WBS_SAV	0.07		14		358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	83.66	59	0		33330			8.06	0.09

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

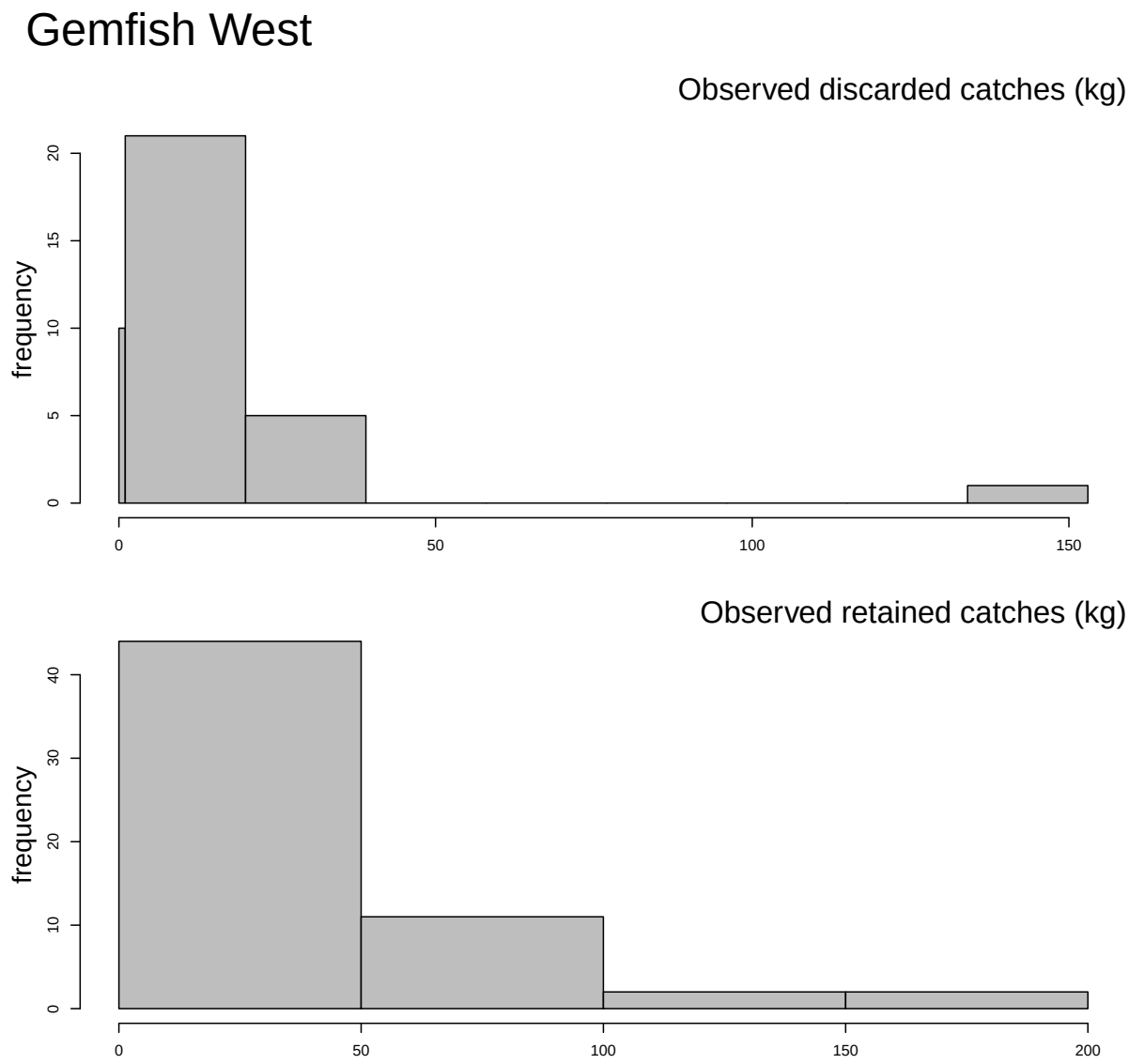

Figure 4.20: Histograms of observed discarded (top) and retained (bottom) catch weights for Gemfish West in 2019. For more information contact AFMA on (02) 6225 5555.

[1] ”Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch.”

Table 24: Gemfish GAB: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA	0.03		10		1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA	0.09		16		279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	0.12	0	0		33330			0	

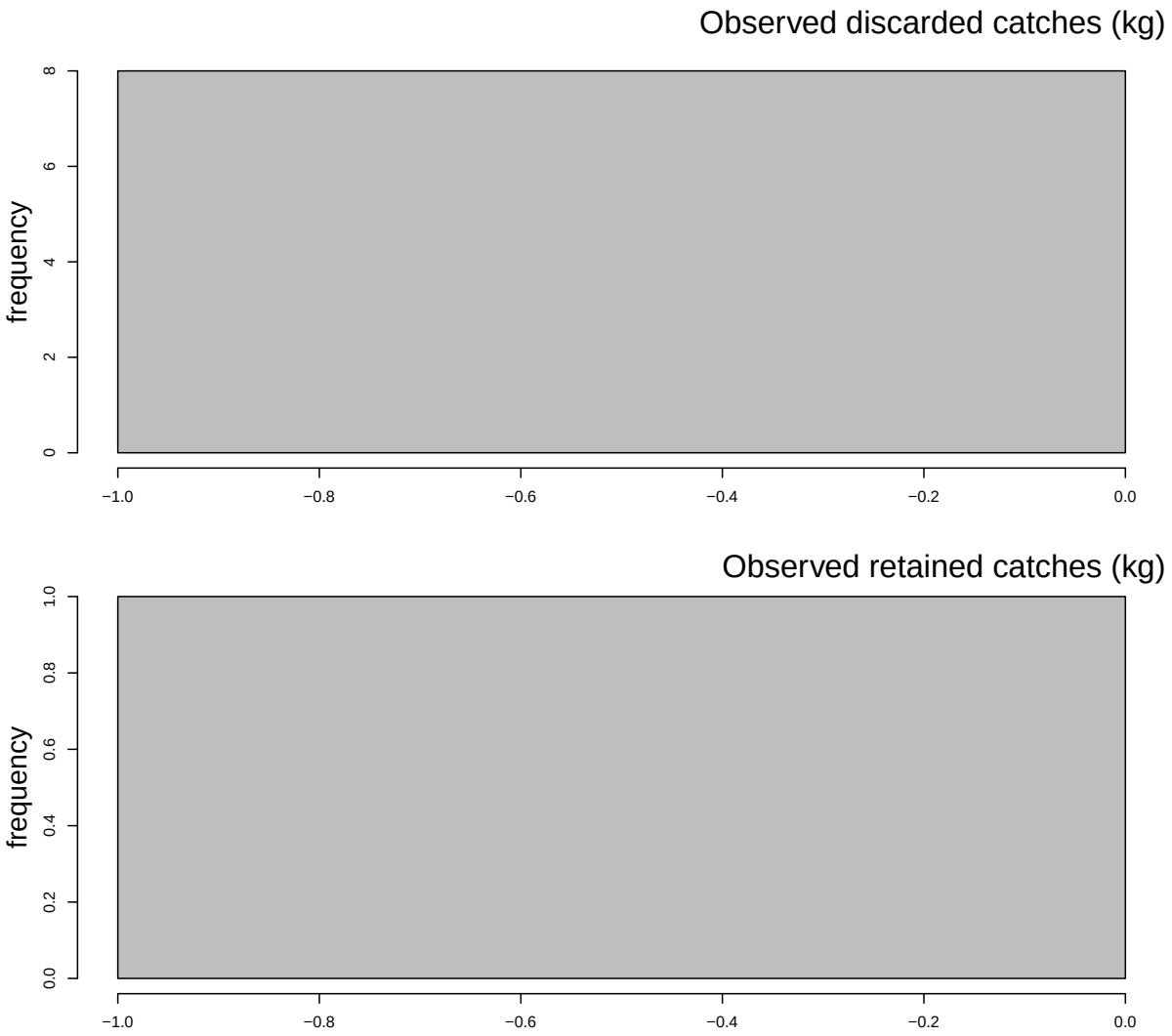

Figure 4.21: Histograms of observed discarded (top) and retained (bottom) catch weights for Gemfish GAB in 2019. For more information contact AFMA on (02) 6225 5555.

Table 25: Pink Ling East: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	0.69	10	25	40	1475	0	0.16	0	0
TR_NSW_OFF	30.65	14	423	3.31	597	0	0.74	0	0
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL	0.99	13	319	4.08	8867	1.29	0.11	1.3	0.57
TR_EDL_IN	10.12	48	498	9.64	3341	3.06	0.53	5.46	0.35
TR_EDL_OFF	170.41	33	1134	2.91	1573	19.09	0.77	23.08	0.12
TR_TAS_BGS					580				
TR_TAS_E	40.25	61	385	15.84	2590	4.01	0.24	2.49	0.06
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN	0		2		40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW	81.59	10	106	9.43	510	30.8	0.22	3.49	0.04
AL_ET_WT	39.88	7	100	7	598	1.39	0.23	0.19	0
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW	0.02		7		3565				
GN_ET_WT	0.01		2		539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	374.61	196	0		33330			36.01	0.09

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

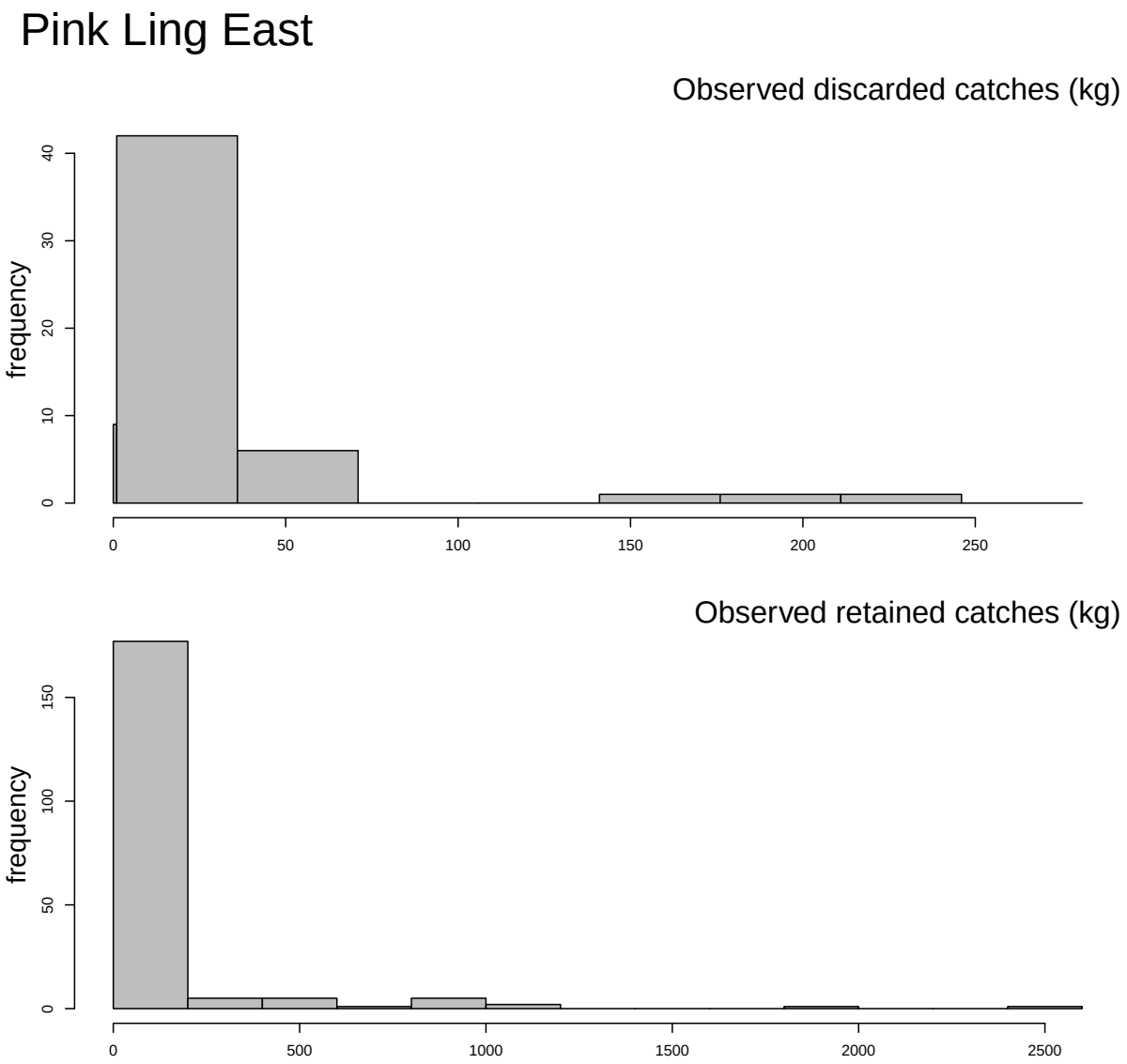

Figure 4.22: Histograms of observed discarded (top) and retained (bottom) catch weights for Pink Ling East in 2019. For more information contact AFMA on (02) 6225 5555.

Table 26: Pink Ling West: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	93.74	76	917	8.29	1895	0.5	0.74	0.7	0.01
DS_EDL	0.02	2	6	33.33	8867	0	0.02	0	0
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W	151.36	85	710	11.97	1081	2.94	0.47	1.49	0.01
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA	0.98		2		1572				
AL_ESA	4.76		13		507				
AL_WBS_SAV	22.64		38		358				
AL_EBS_NSW					510				
AL_ET_WT	114.42	24	112	21.43	598	4.75	0.77	2.2	0.02
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA	0.06		8		98				
GN_SAV	0.02		6		482				
GN_WBS	0		2		1514				
GN_EBS_NSW					3565				
GN_ET_WT	0.01		1		539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	388.01	187	0		33330			4.39	0.01

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

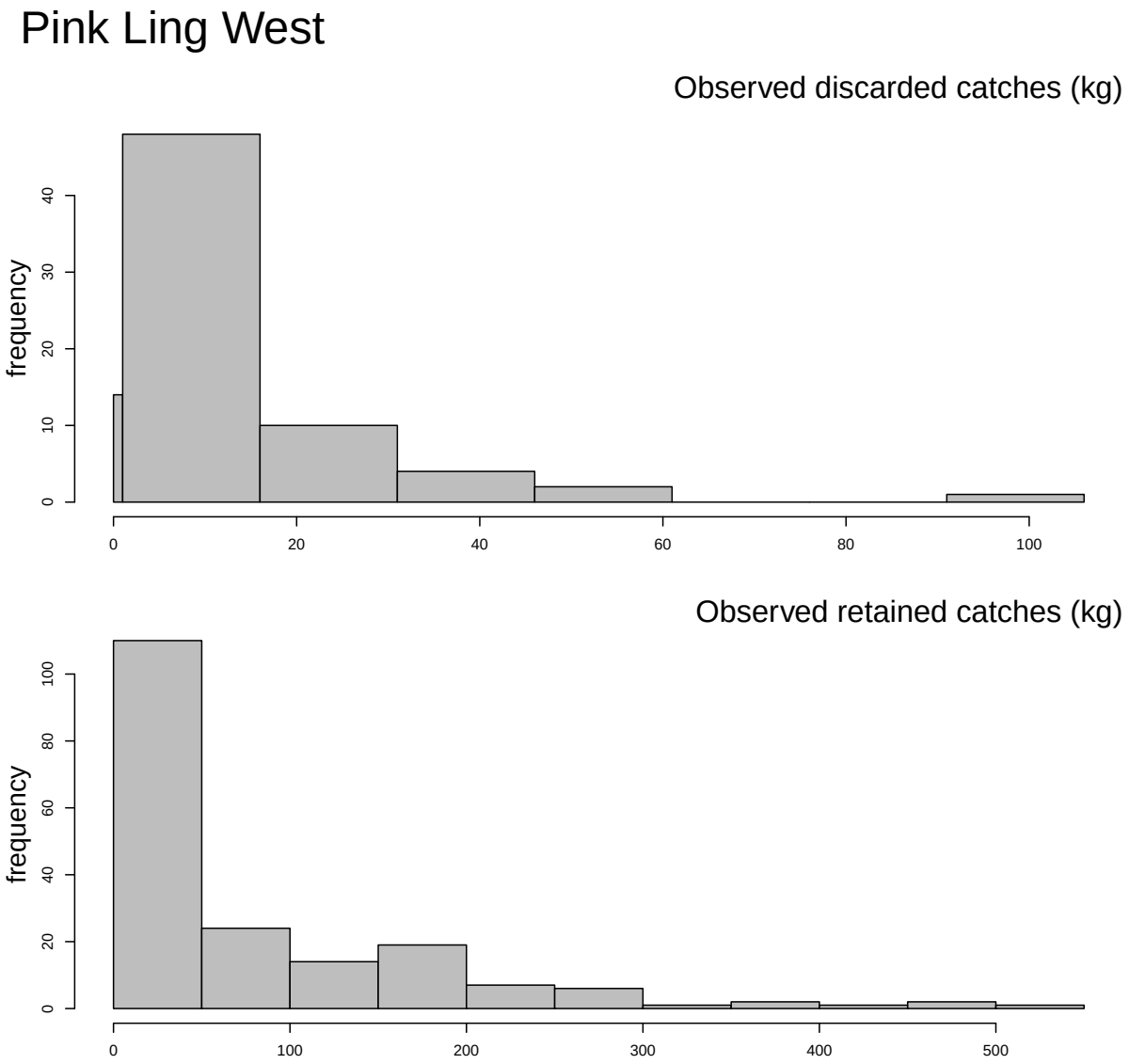

Figure 4.23: Histograms of observed discarded (top) and retained (bottom) catch weights for Pink Ling West in 2019. For more information contact AFMA on (02) 6225 5555.

Table 27: Mirror Dory East: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	1.35	9	25	36	1475	14.54	0.15	3.16	0.7
TR_NSW_OFF	16.42	9	213	4.23	597	0	0.47	0	0
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL	2.07	9	165	5.45	8867	0.03	0.08	0.02	0.01
TR_EDL_IN	20.37	35	467	7.49	3341	7.58	0.39	9.85	0.33
TR_EDL_OFF	18.46	30	555	5.41	1573	20.59	0.7	22.62	0.55
TR_TAS_BGS					580				
TR_TAS_E	9.56	40	336	11.9	2590	1.67	0.16	0.68	0.07
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT	0		1		598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW	0		2		3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	68.23	132	0		33330			36.33	0.35

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

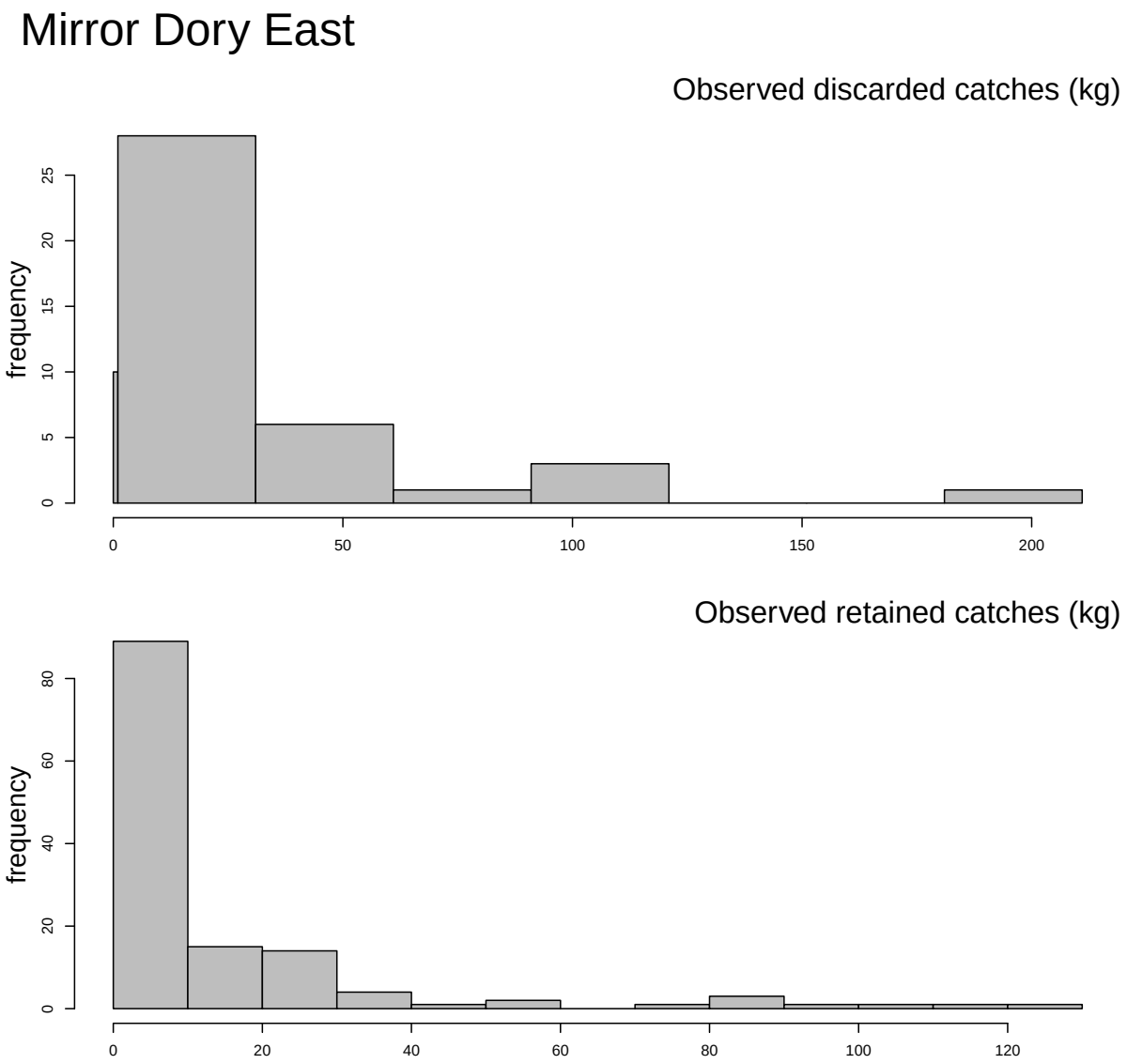

Figure 4.24: Histograms of observed discarded (top) and retained (bottom) catch weights for Mirror Dory East in 2019. For more information contact AFMA on (02) 6225 5555.

Table 28: Mirror Dory West: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	27.14	41	416	9.86	1895	4.13	0.4	3.12	0.1
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W	7.34	51	176	28.98	1081	1.4	0.28	0.42	0.05
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA	0		1		328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	34.48	92	0		33330			3.54	0.09

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

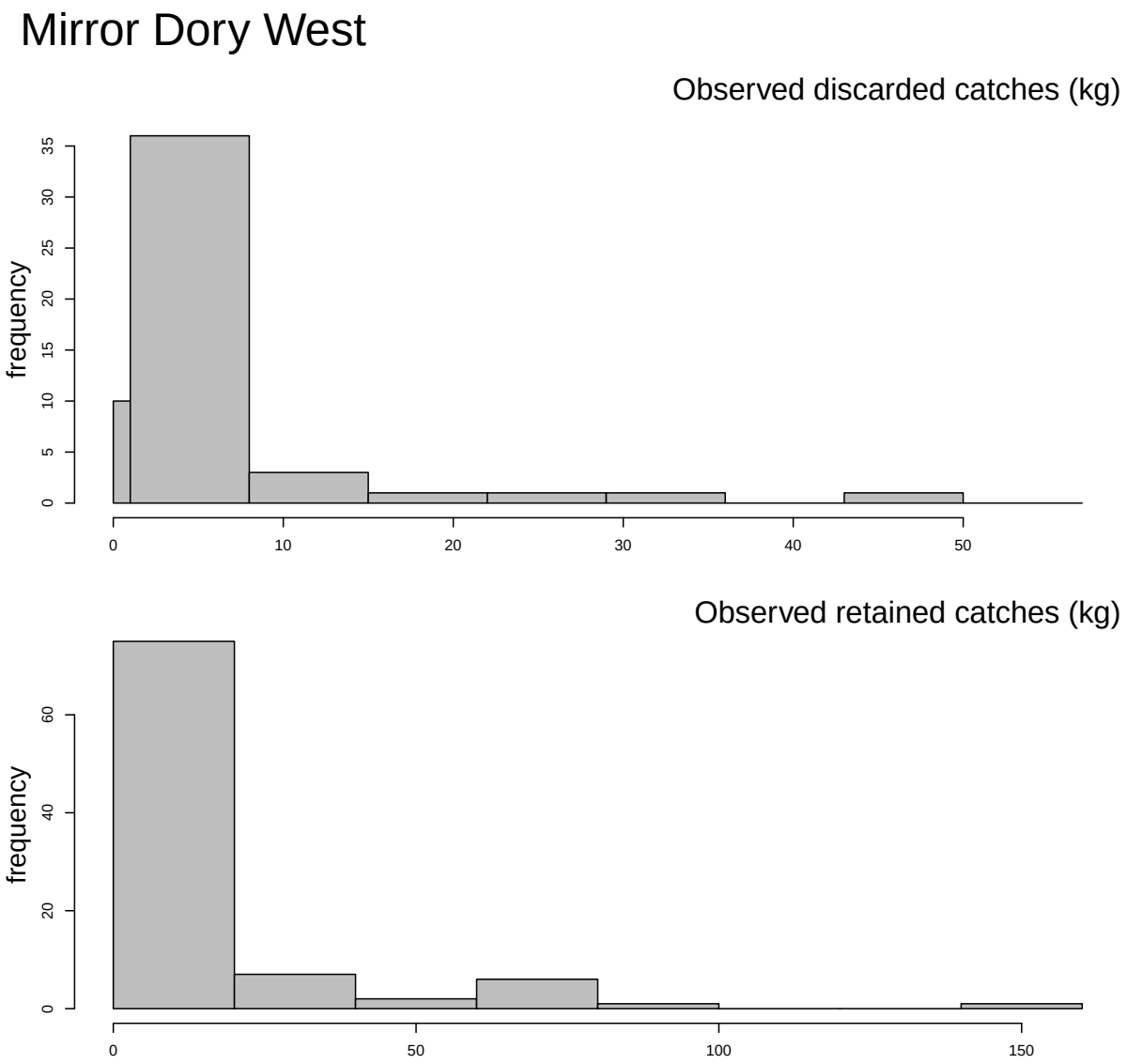

Figure 4.25: Histograms of observed discarded (top) and retained (bottom) catch weights for Mirror Dory West in 2019. For more information contact AFMA on (02) 6225 5555.

Table 29: Ocean Perch Inshore: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	2.64	25	67	37.31	1475	42.97	0.41	25.97	0.91
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	0.06	1	1	100	1895	3.44	0.01	0.06	0.5
DS_EDL	0.09	17	12	141.67	8867	11.38	0.15	15.05	0.99
TR_EDL_IN	3.18	38	117	32.48	3341	19.18	0.42	27.06	0.89
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E	0.46	22	29	75.86	2590	1.68	0.09	0.38	0.45
TR_TAS_ORO					27				
TR_TAS_W	0.04		4		1081				
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA	0		1		1572				
AL_ESA	0.28		20		507				
AL_WBS_SAV	0.04		6		358				
AL_EBS_NSW	0.01	3	1	300	510	0.33	0.07	0.01	0.5
AL_ET_WT	0.06		10		598				
AL_WSA_WA					279				
GN_CSA	0		1		328				
GN_ESA	0.01		2		98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW	0		1		3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	6.87	106	0		33330			68.53	0.91

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

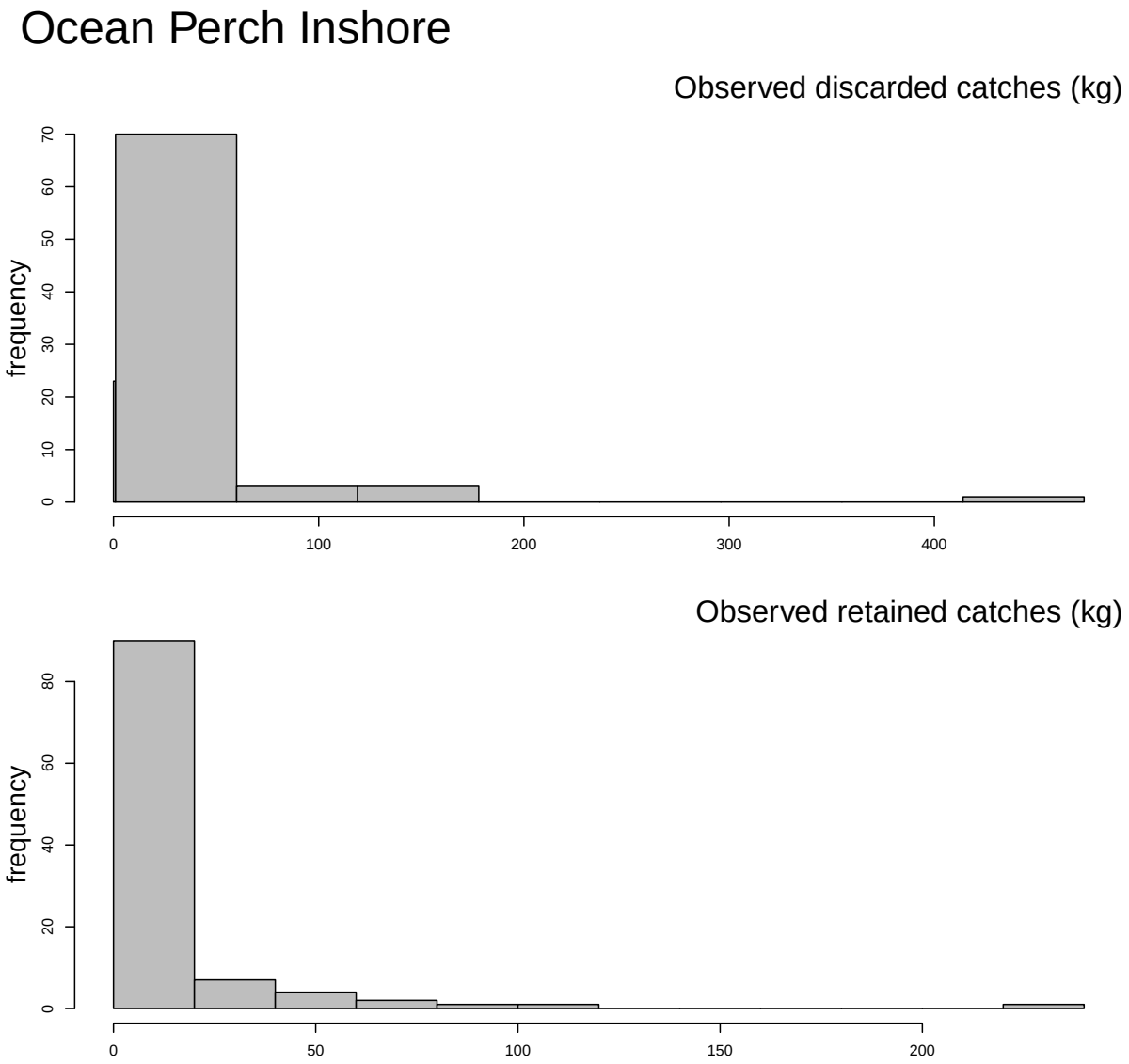

Figure 4.26: Histograms of observed discarded (top) and retained (bottom) catch weights for Ocean Perch Inshore in 2019. For more information contact AFMA on (02) 6225 5555.

Table 30: Ocean Perch Offshore: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF	40.54	13	370	3.51	597	8.47	0.68	3.46	0.08
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	7.64	35	192	18.23	1895	9.12	0.34	5.87	0.43
DS_EDL	0	1	2	50	8867	0.51	0.01	0.04	1
TR_EDL_IN					3341				
TR_EDL_OFF	65.55	29	923	3.14	1573	14.82	0.67	15.74	0.19
TR_TAS_BGS					580				
TR_TAS_E	4.98	31	203	15.27	2590	2.47	0.12	0.78	0.14
TR_TAS_ORO					27				
TR_TAS_W	4.03	10	118	8.47	1081	1.4	0.05	0.08	0.02
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA	1.42		35		1572				
AL_ESA	0.36		12		507				
AL_WBS_SAV	1.97		49		358				
AL_EBS_NSW	19.41	17	104	16.35	510	5.91	0.38	1.14	0.06
AL_ET_WT	3.68	31	221	14.03	598	0.89	1	0.53	0.13
AL_WSA_WA	0.5		32		279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	150.08	167	0		33330			27.64	0.16

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

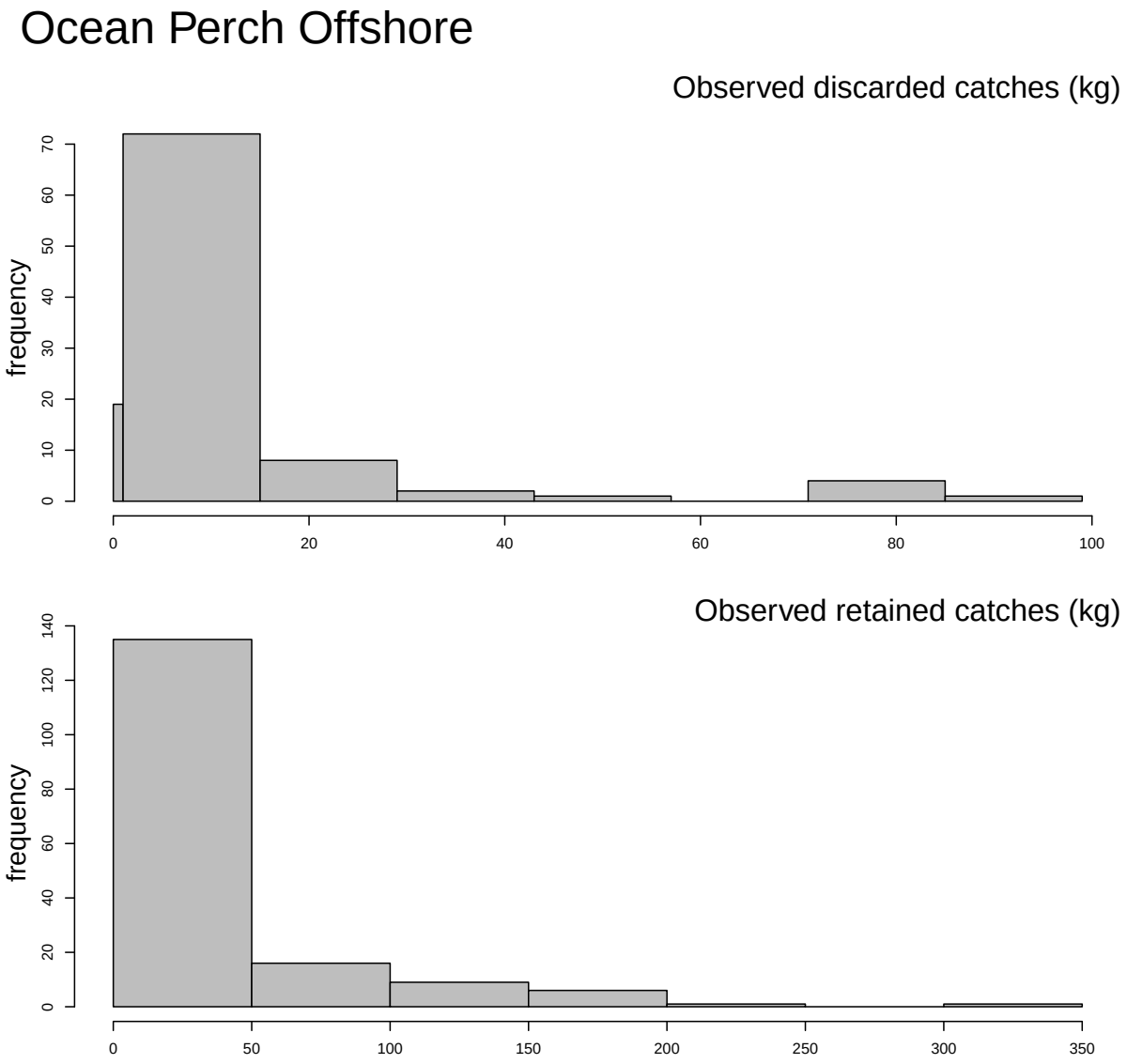

Figure 4.27: Histograms of observed discarded (top) and retained (bottom) catch weights for Ocean Perch Offshore in 2019. For more information contact AFMA on (02) 6225 5555.

Table 31: Silver Warehou: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	2.11	19	37	51.35	1475	17.68	0.31	8.12	0.79
TR_NSW_OFF	0.77	6	28	21.43	597	0	0.32	0	0
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	113.93	61	779	7.83	1895	18.81	0.59	21.11	0.16
DS_EDL	0.17	5	5	100	8867	9.54	0.04	3.71	0.96
TR_EDL_IN	5.47	26	165	15.76	3341	29.42	0.29	28.4	0.84
TR_EDL_OFF	46.62	32	715	4.48	1573	17.06	0.74	20	0.3
TR_TAS_BGS					580				
TR_TAS_E	15.19	43	245	17.55	2590	26.48	0.17	11.61	0.43
TR_TAS_ORO					27				
TR_TAS_W	118.9	122	532	22.93	1081	19.56	0.67	14.18	0.11
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA	0		1		507				
AL_WBS_SAV	0		2		358				
AL_EBS_NSW	0		1		510				
AL_ET_WT	0.03		5		598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	303.19	314	0		33330			107.13	0.26

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

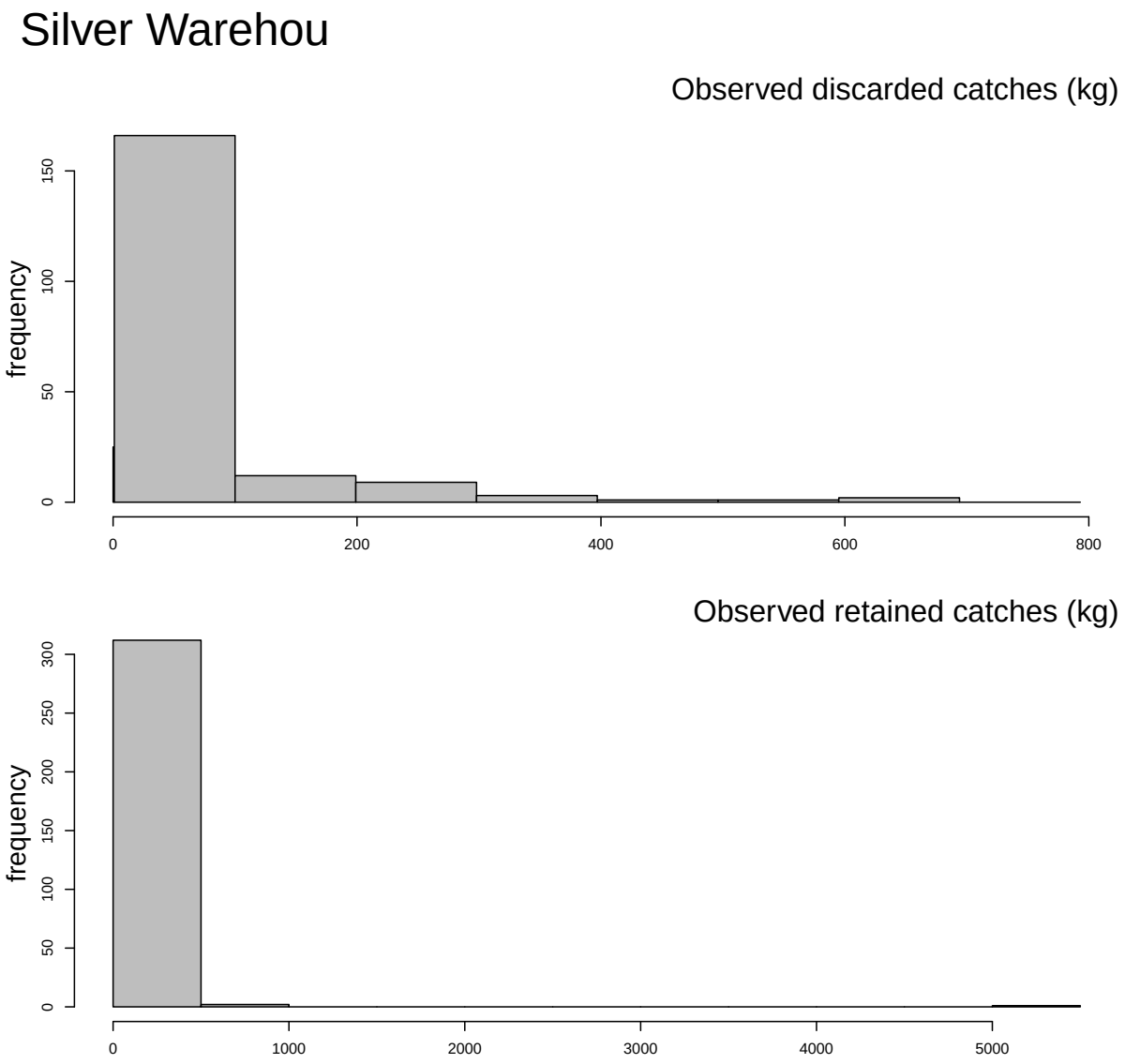

Figure 4.28: Histograms of observed discarded (top) and retained (bottom) catch weights for Silver Warehou in 2019. For more information contact AFMA on (02) 6225 5555.

Table 32: Ribaldo: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	0.18		3		1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	16.66	19	181	10.5	1895	2.94	0.18	1.03	0.06
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF	4.52	5	124	4.03	1573	2.75	0.12	0.5	0.1
TR_TAS_BGS					580				
TR_TAS_E	10.2	47	150	31.33	2590	1.8	0.19	0.86	0.08
TR_TAS_ORO					27				
TR_TAS_W	35.98	51	302	16.89	1081	3.27	0.28	0.99	0.03
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA	0.91		2		1572				
AL_ESA	1.52		32		507				
AL_WBS_SAV	4.89		36		358				
AL_EBS_NSW	6.17	2	47	4.26	510	294	0.04	6.66	0.52
AL_ET_WT	28.3	23	201	11.44	598	13.29	0.74	5.89	0.17
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	109.33	147	0		33330			15.93	0.14

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

Ribaldo

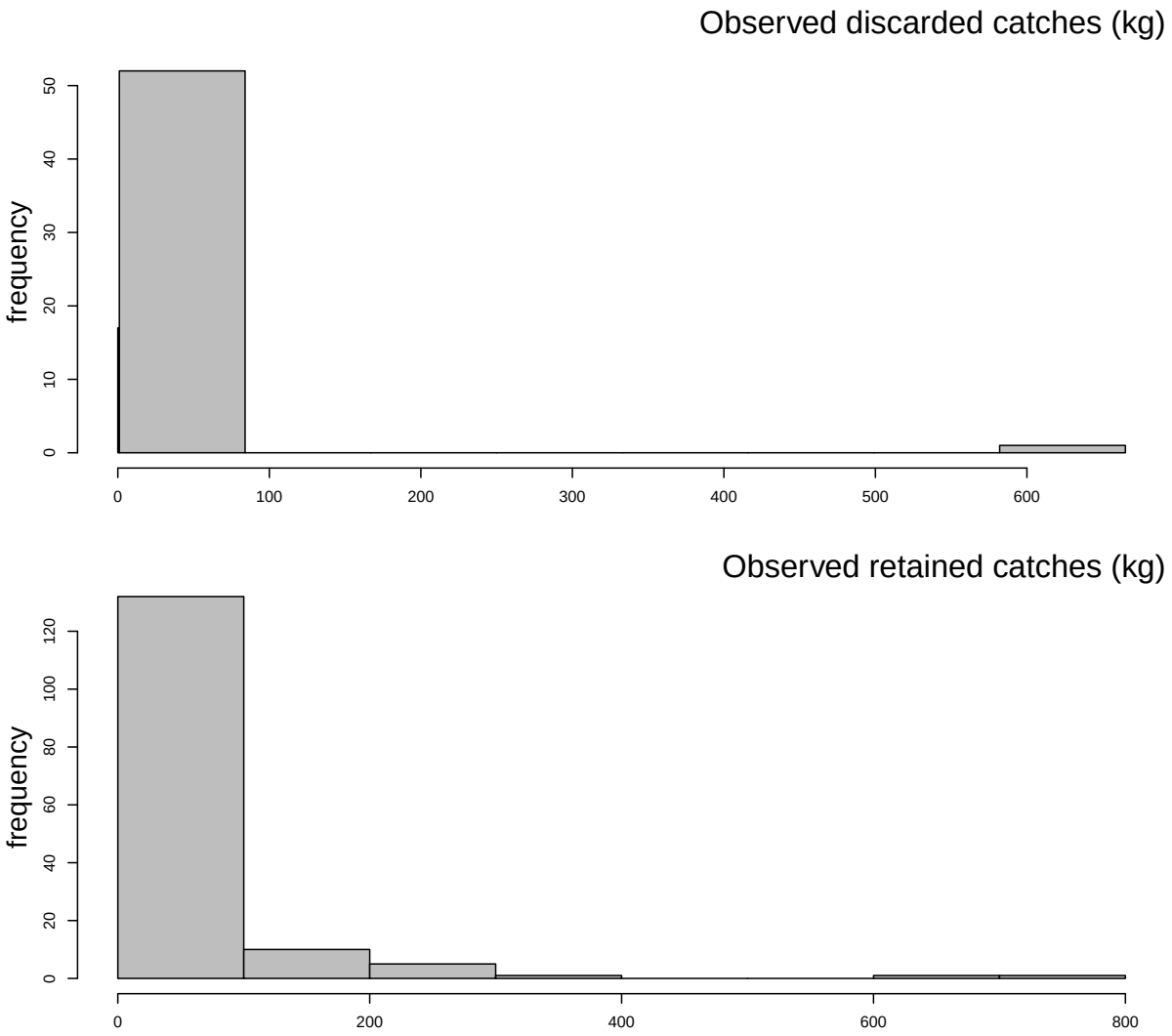

Figure 4.29: Histograms of observed discarded (top) and retained (bottom) catch weights for Ribaldo in 2019. For more information contact AFMA on (02) 6225 5555.

Table 33: Orange Roughy East: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E	51.99	15	65	23.08	2590	0	0.06	0	0
TR_TAS_ORO	24.06	12	23	52.17	27	4.17	0.92	0.1	0
TR_TAS_W					1081				
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO	511.31	69	126	54.76	126	3.3	1	0.42	0
TR_SPH_ORO	129.73	12	43	27.91	43	5.42	1	0.23	0
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	717.09	108	0		33330			0.75	0

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

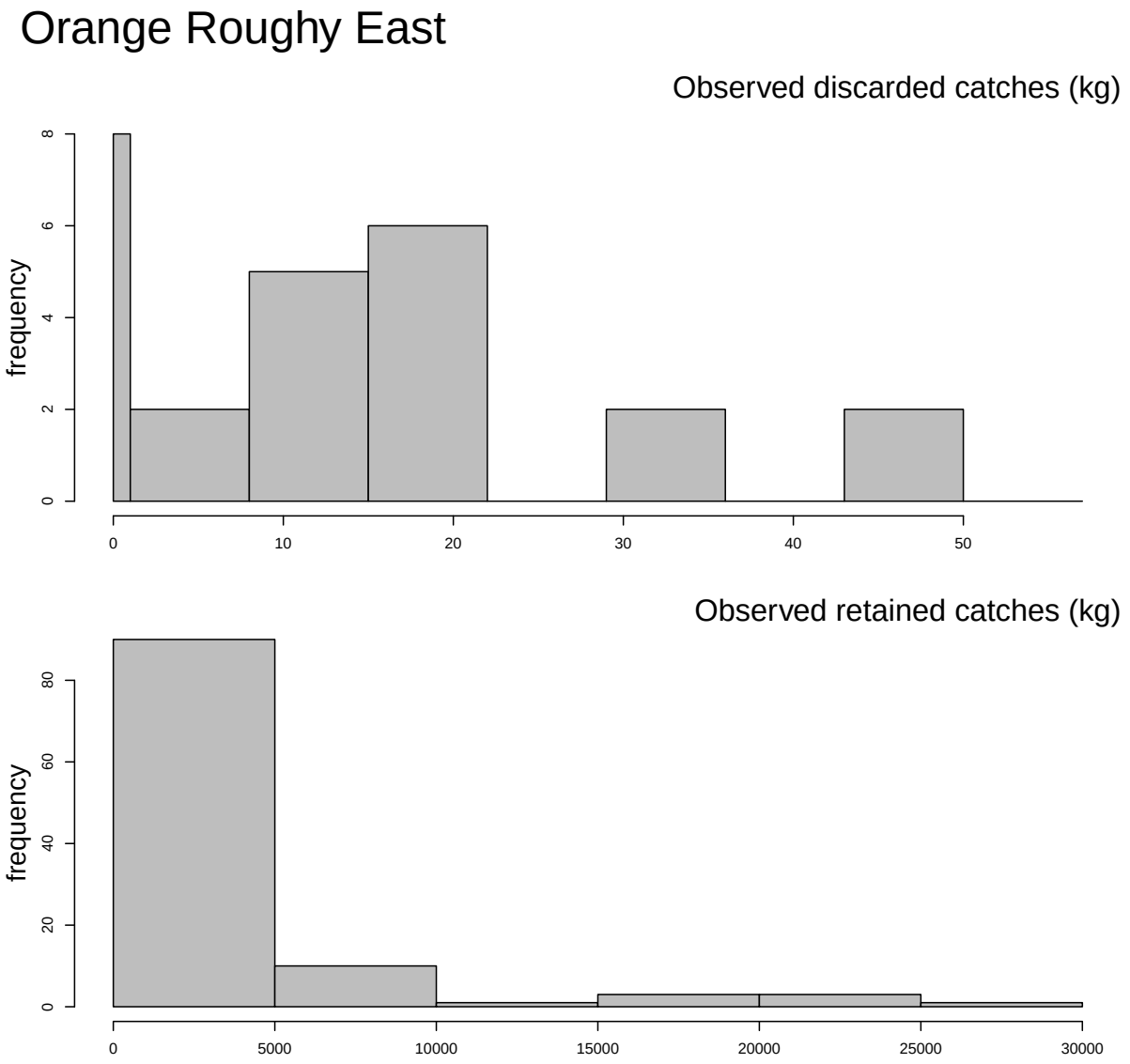

Figure 4.30: Histograms of observed discarded (top) and retained (bottom) catch weights for Orange Roughy East in 2019. For more information contact AFMA on (02) 6225 5555.

Table 34: Orange Roughy West: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E	57.26		36		2590				
TR_TAS_ORO					27				
TR_TAS_W	22.07		14		1081				
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	79.33	0	0		33330			0	

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

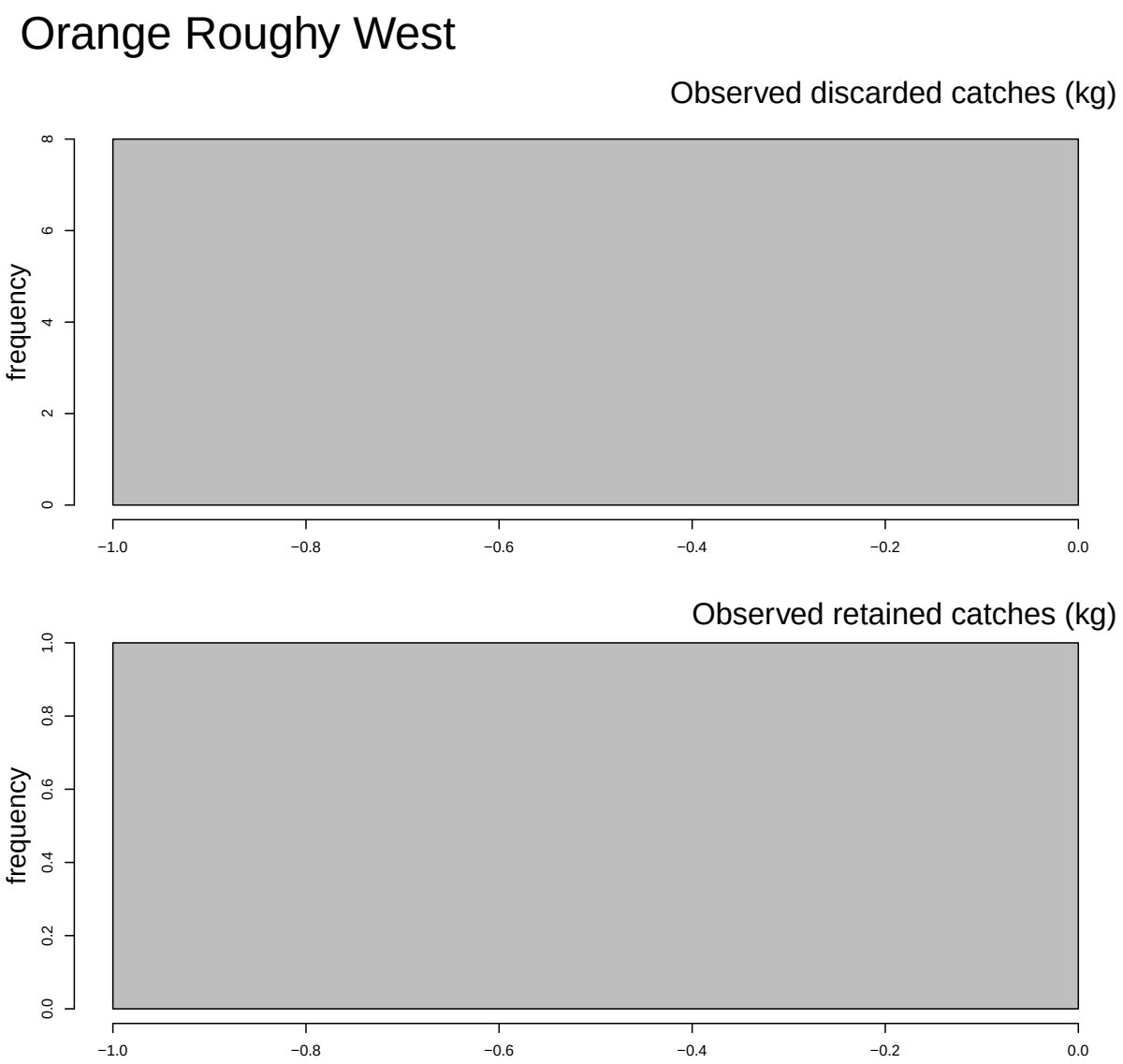

Figure 4.31: Histograms of observed discarded (top) and retained (bottom) catch weights for Orange Roughy West in 2019. For more information contact AFMA on (02) 6225 5555.

Table 35: Orange Roughy South: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO	8.71		4		27				
TR_TAS_W	9.73	1	23	4.35	1081	0	0.01	0	0
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	18.44	1	0		33330			0	0

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

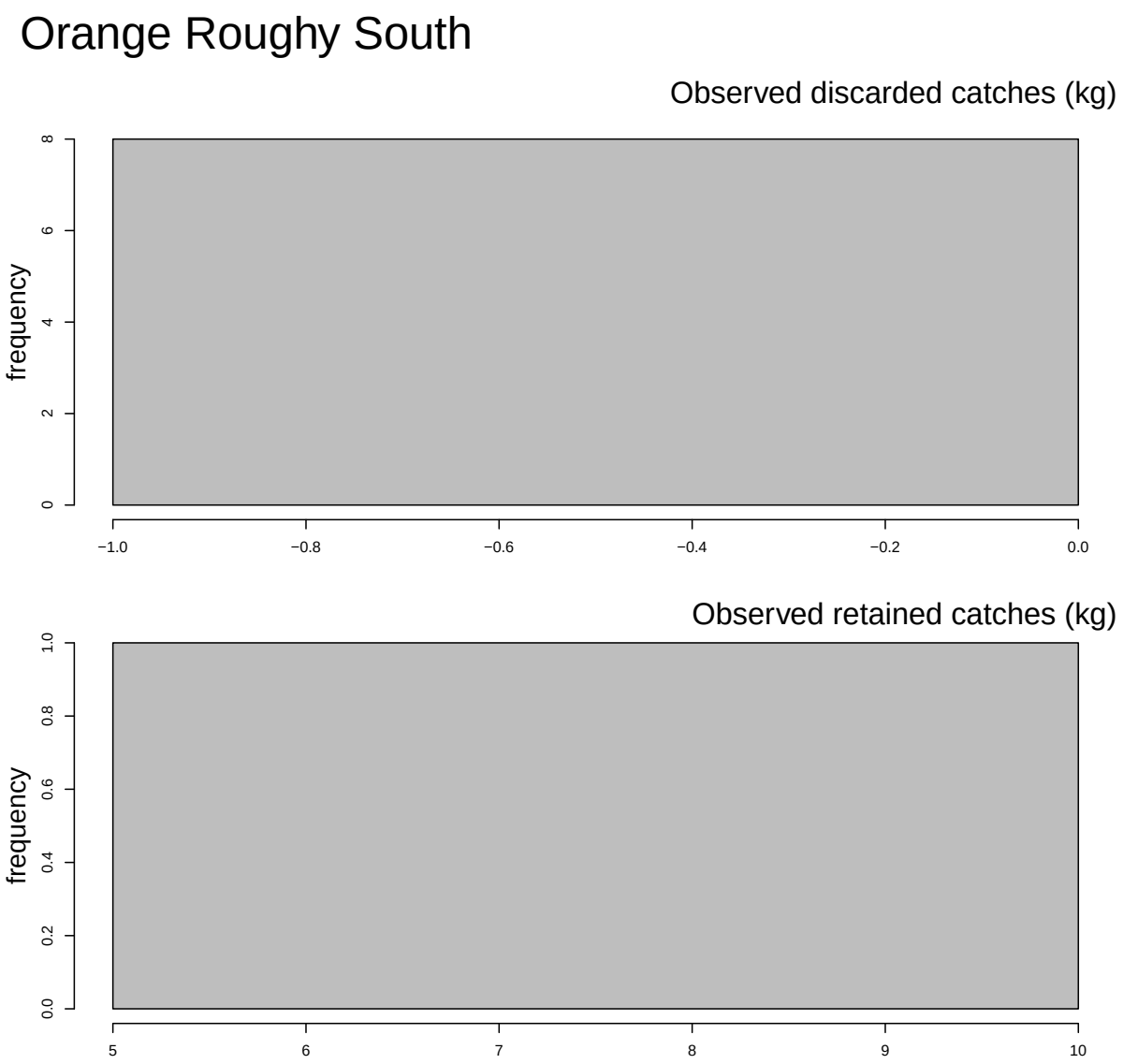

Figure 4.32: Histograms of observed discarded (top) and retained (bottom) catch weights for Orange Roughy South in 2019. For more information contact AFMA on (02) 6225 5555.

Table 36: Orange Roughy Cascade: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	11.4	5	81	6.17	1895	17.87	0.05	1.64	0.13
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W	6.96	1	51	1.96	1081	0	0.01	0	0
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	18.36	6	0		33330			1.64	0.08

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

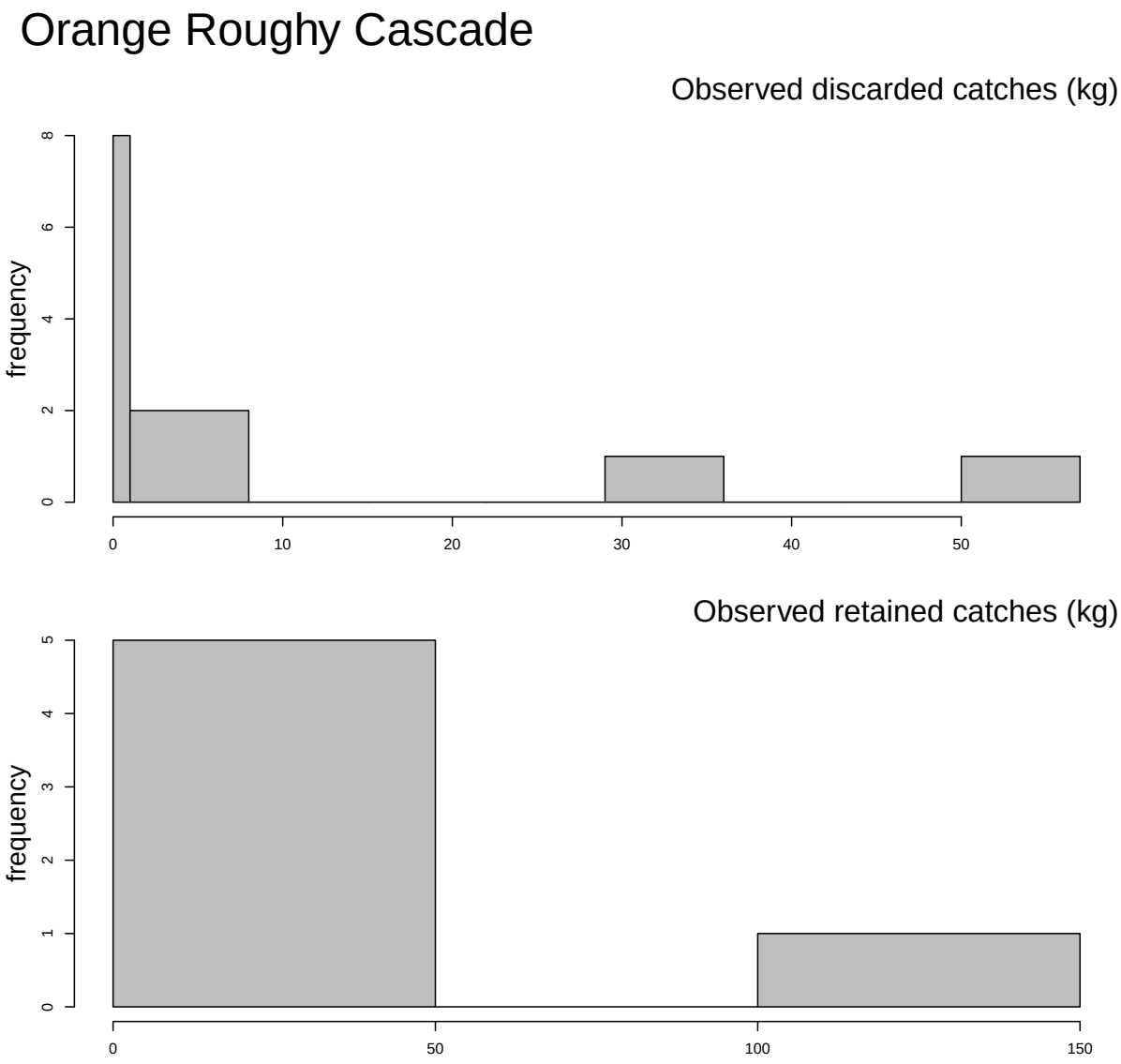

Figure 4.33: Histograms of observed discarded (top) and retained (bottom) catch weights for Orange Roughy Cascade in 2019. For more information contact AFMA on (02) 6225 5555.

[1] ”Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch.”

Table 37: Orange Roughy GAB: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF	3.03	2	20	10	1573	115.5	0.05	8.46	0.74
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN					40				
TR_GAB_In					2298				
TR_GAB_Mid					93				
TR_GAB_Off									
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	3.03	2	0		35721			8.46	0.74

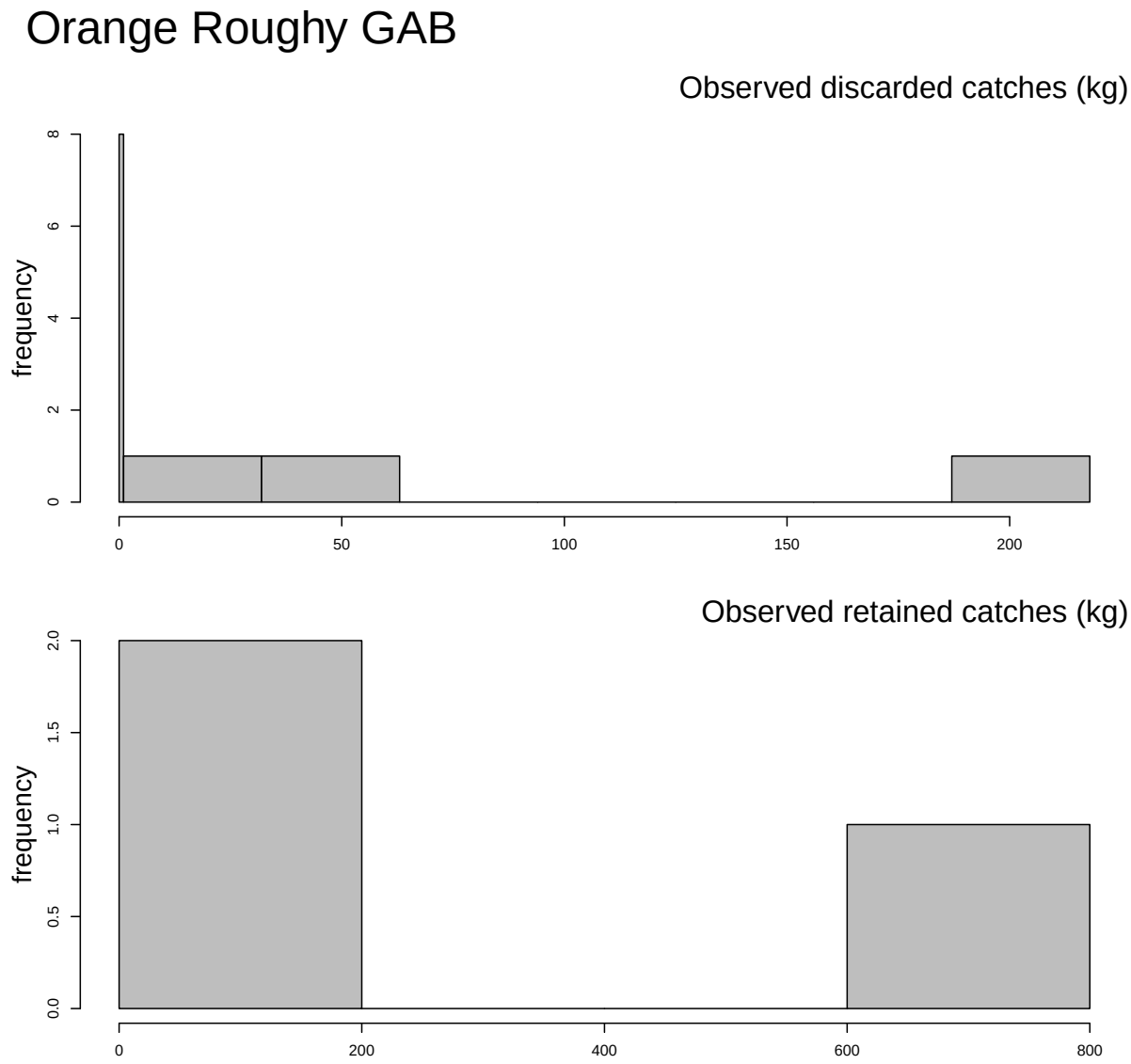

Figure 4.34: Histograms of observed discarded (top) and retained (bottom) catch weights for Orange Roughy GAB in 2019. For more information contact AFMA on (02) 6225 5555.

Table 38: Oreos: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	12.97	4	99	4.04	1895	11.62	0.04	0.85	0.06
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E	20.7	111	156	71.15	2590	0.64	0.44	0.72	0.03
TR_TAS_ORO					27				
TR_TAS_W	51.57	34	238	14.29	1081	9.94	0.19	2.01	0.04
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA	0.18		19		1572				
AL_ESA					507				
AL_WBS_SAV	0.03		9		358				
AL_EBS_NSW					510				
AL_ET_WT	1.03	6	67	8.96	598	0	0.19	0	0
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	86.48	155	0		33330			3.58	0.04

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

Oreos

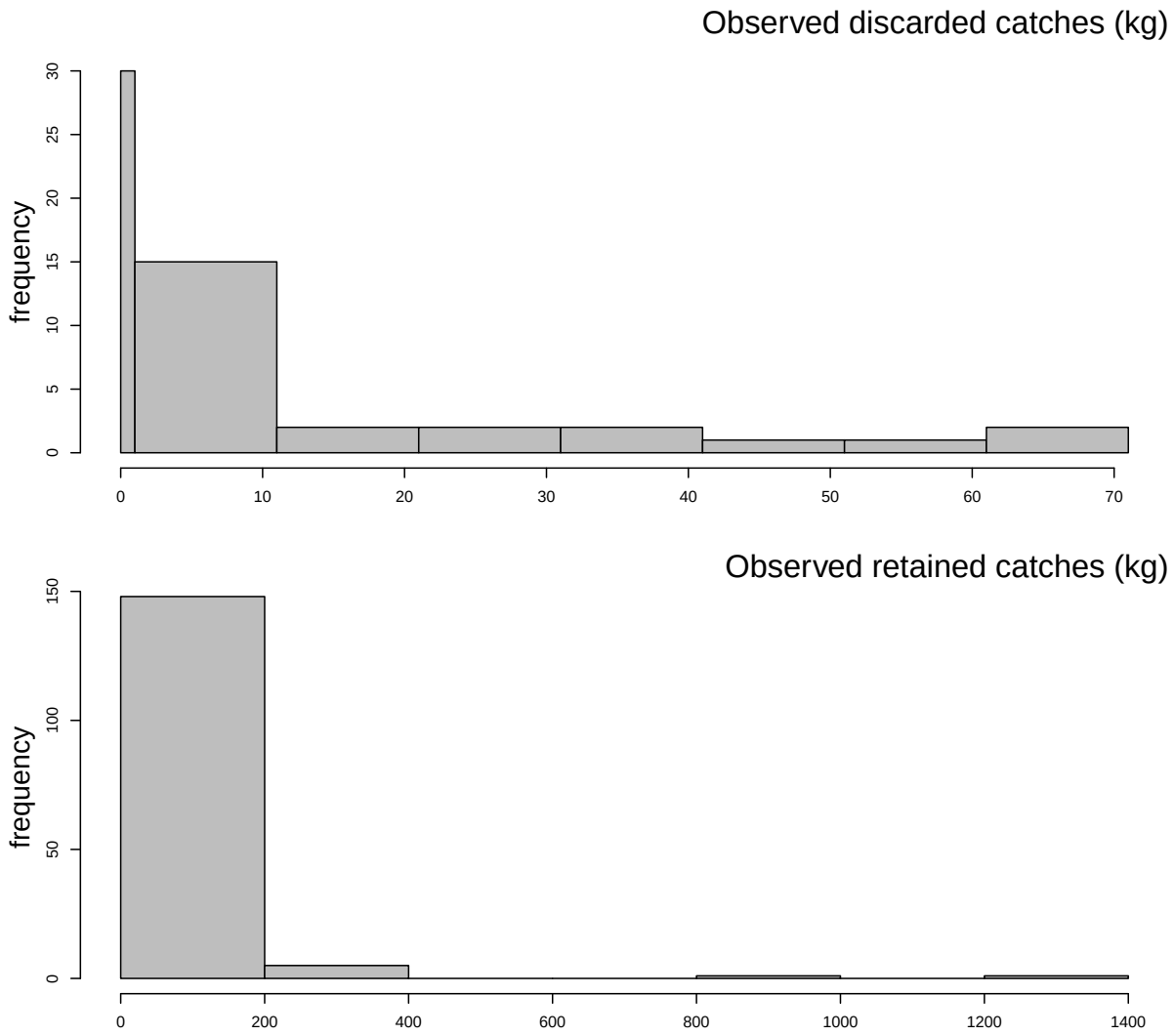

Figure 4.35: Histograms of observed discarded (top) and retained (bottom) catch weights for Oreos in 2019. For more information contact AFMA on (02) 6225 5555.

Table 39: Smooth Oreo Cascade: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	2.15		13		1895				
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	2.15	0	0		33330			0	

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

Smooth Oreo Cascade

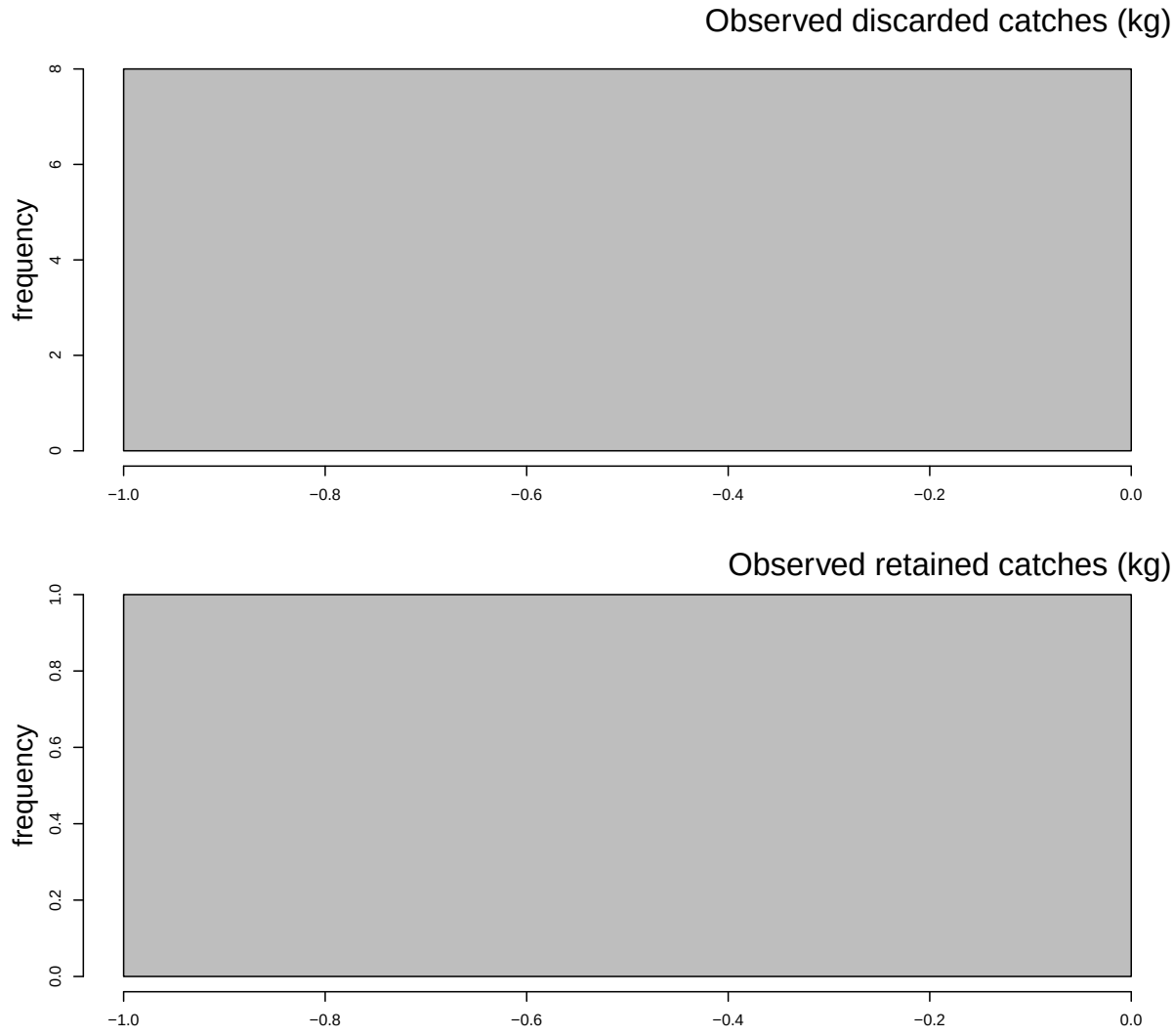

Figure 4.36: Histograms of observed discarded (top) and retained (bottom) catch weights for Smooth Oreo Cascade in 2019. For more information contact AFMA on (02) 6225 5555.

Table 40: Smooth Oreo Non-Cascade: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E	56.51	5	29	17.24	2590	4.68	0.02	0.24	0
TR_TAS_ORO					27				
TR_TAS_W	15.82		9		1081				
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	72.33	5	0		33330			0.24	0

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

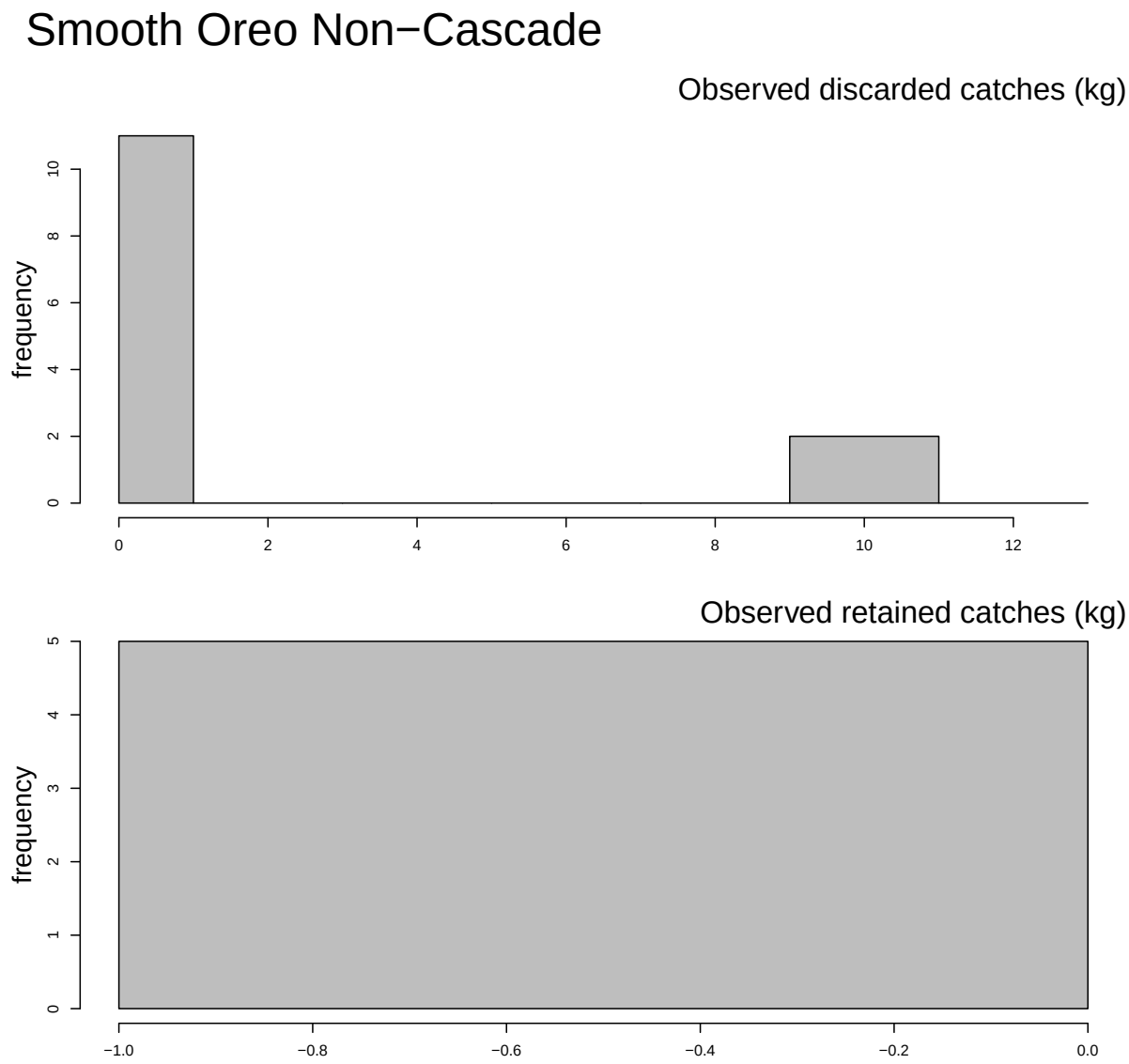

Figure 4.37: Histograms of observed discarded (top) and retained (bottom) catch weights for Smooth Oreo Non-Cascade in 2019. For more information contact AFMA on (02) 6225 5555.

Table 41: Deepwater Shark East: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF	5.24	3	90	3.33	1573	160.39	0.07	17.62	0.77
TR_TAS_BGS					580				
TR_TAS_E	7.25	63	65	96.92	2590	13.78	0.25	8.85	0.55
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	12.49	66	0		33330			26.47	0.68

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

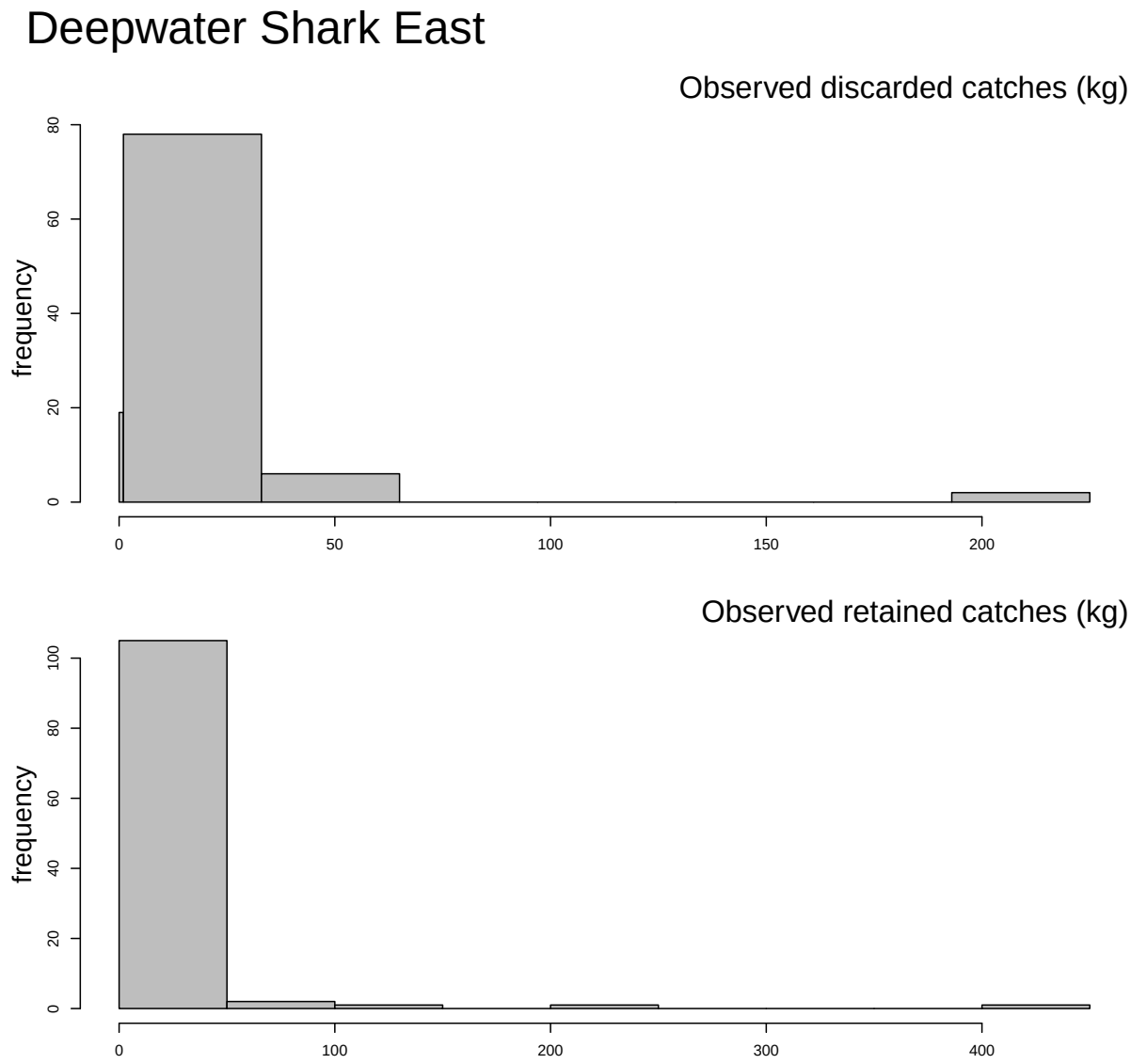

Figure 4.38: Histograms of observed discarded (top) and retained (bottom) catch weights for Deepwater Shark East in 2019. For more information contact AFMA on (02) 6225 5555.

Table 42: Deepwater Shark West: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	35.94	6	199	3.02	1895	6.01	0.06	0.66	0.02
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W	59.84	6	308	1.95	1081	124.47	0.03	4.44	0.07
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV	0.07		2		358				
AL_EBS_NSW					510				
AL_ET_WT	0		1		598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	95.85	12	0		33330			5.1	0.05

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

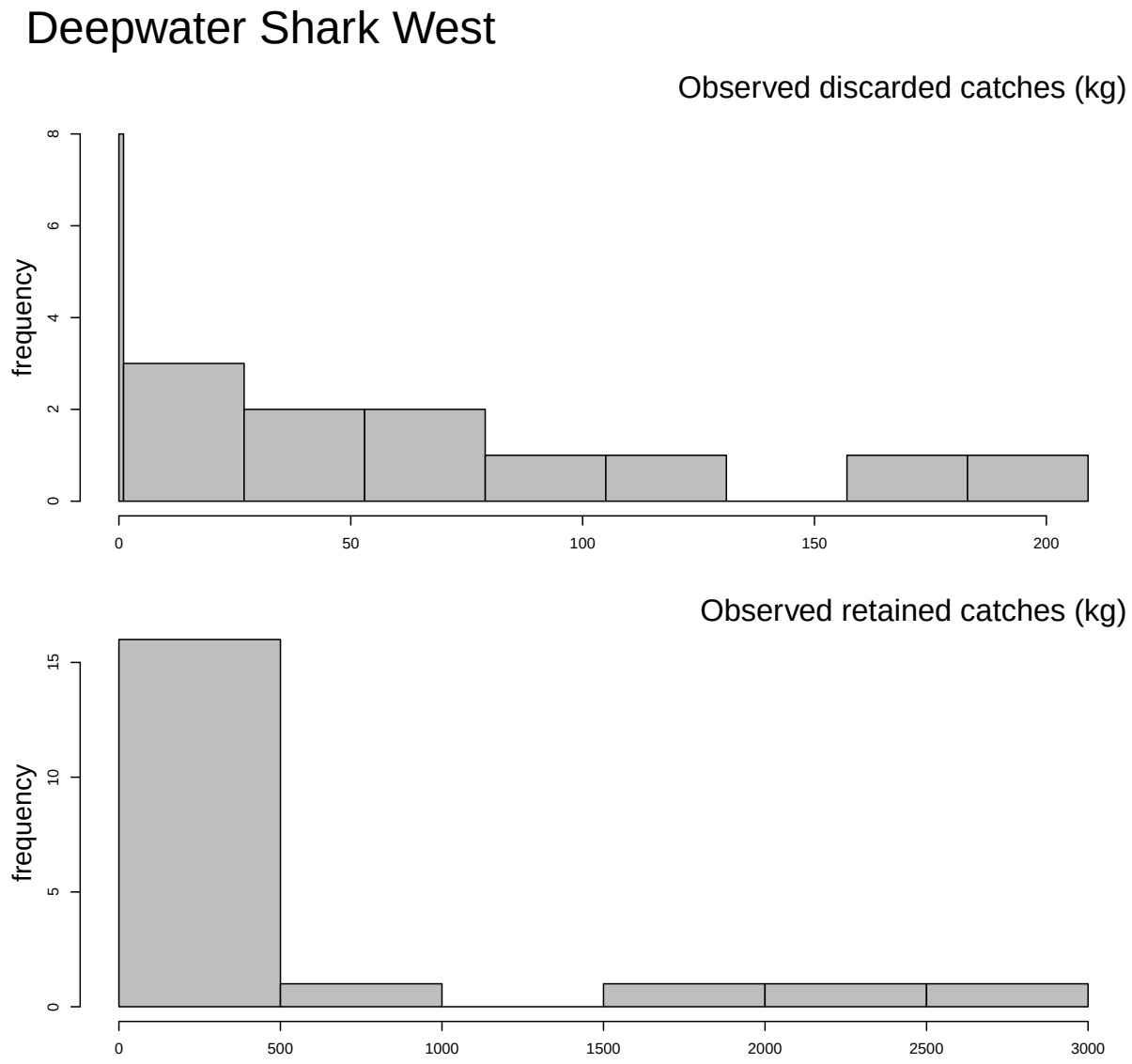

Figure 4.39: Histograms of observed discarded (top) and retained (bottom) catch weights for Deepwater Shark West in 2019. For more information contact AFMA on (02) 6225 5555.

[1] ”Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch.”

Table 43: Bight Redfish: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN					40				
TR_GAB_In	112.37		454		2298				
TR_GAB_Mid	0.05		2		93				
TR_GAB_Off									
TR_ECDW					14				
AL_CSA	0.22		11		1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA	0.01		2		279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	112.65	0	0		35721			0	

Bight Redfish

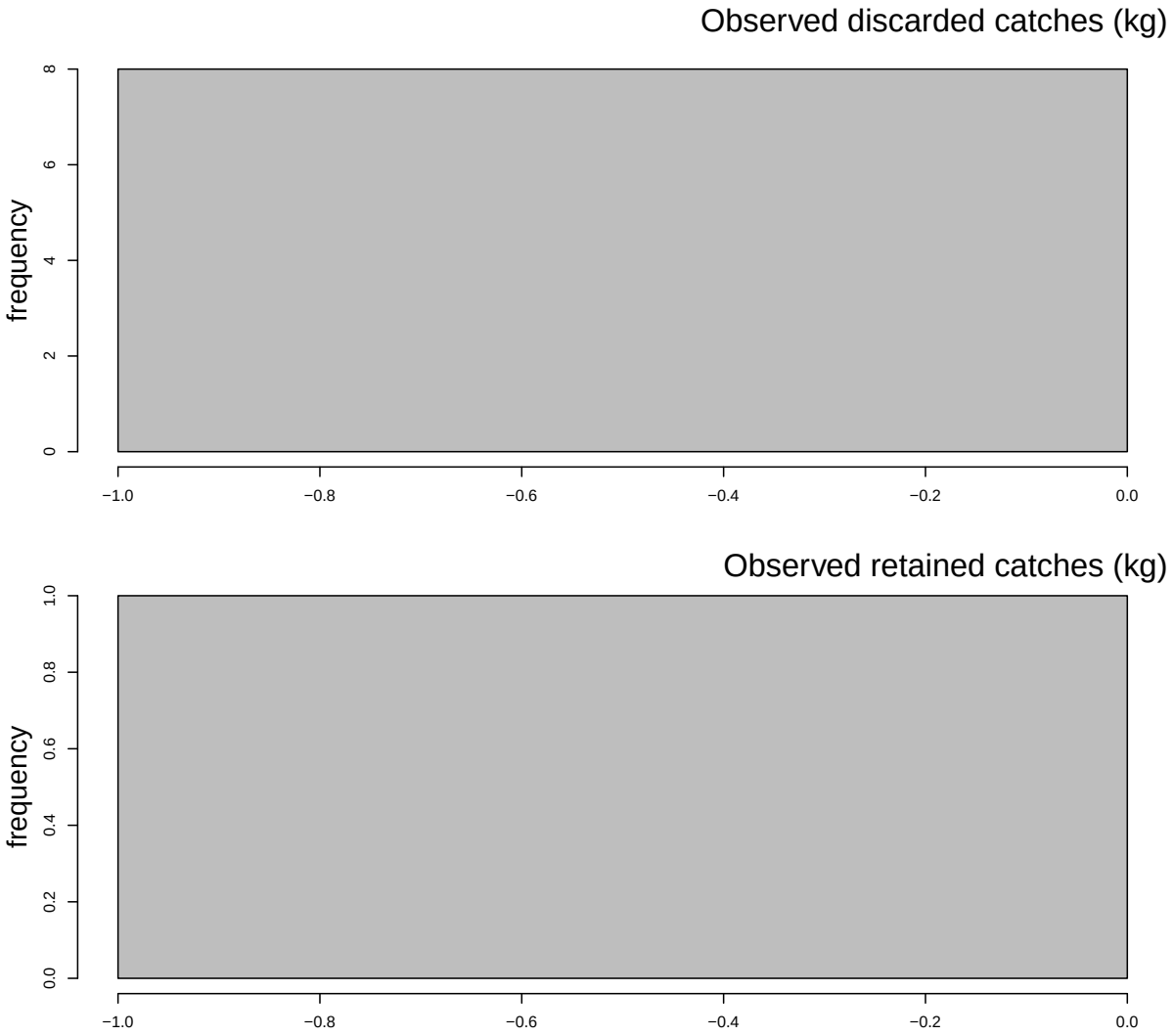

Figure 4.40: Histograms of observed discarded (top) and retained (bottom) catch weights for Bight Redfish in 2019. For more information contact AFMA on (02) 6225 5555.

[1] ”Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch.”

Table 44: Deepwater Flathead: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN					1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW					1895				
DS_EDL					8867				
TR_EDL_IN					3341				
TR_EDL_OFF					1573				
TR_TAS_BGS					580				
TR_TAS_E					2590				
TR_TAS_ORO					27				
TR_TAS_W					1081				
TR_BS_IN					40				
TR_GAB_In	366.06		1006		2298				
TR_GAB_Mid	2.93		19		93				
TR_GAB_Off									
TR_ECDW					14				
AL_CSA					1572				
AL_ESA					507				
AL_WBS_SAV					358				
AL_EBS_NSW					510				
AL_ET_WT					598				
AL_WSA_WA					279				
GN_CSA					328				
GN_ESA					98				
GN_SAV					482				
GN_WBS					1514				
GN_EBS_NSW					3565				
GN_ET_WT					539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	368.99	0	0		35721			0	

Deepwater Flathead

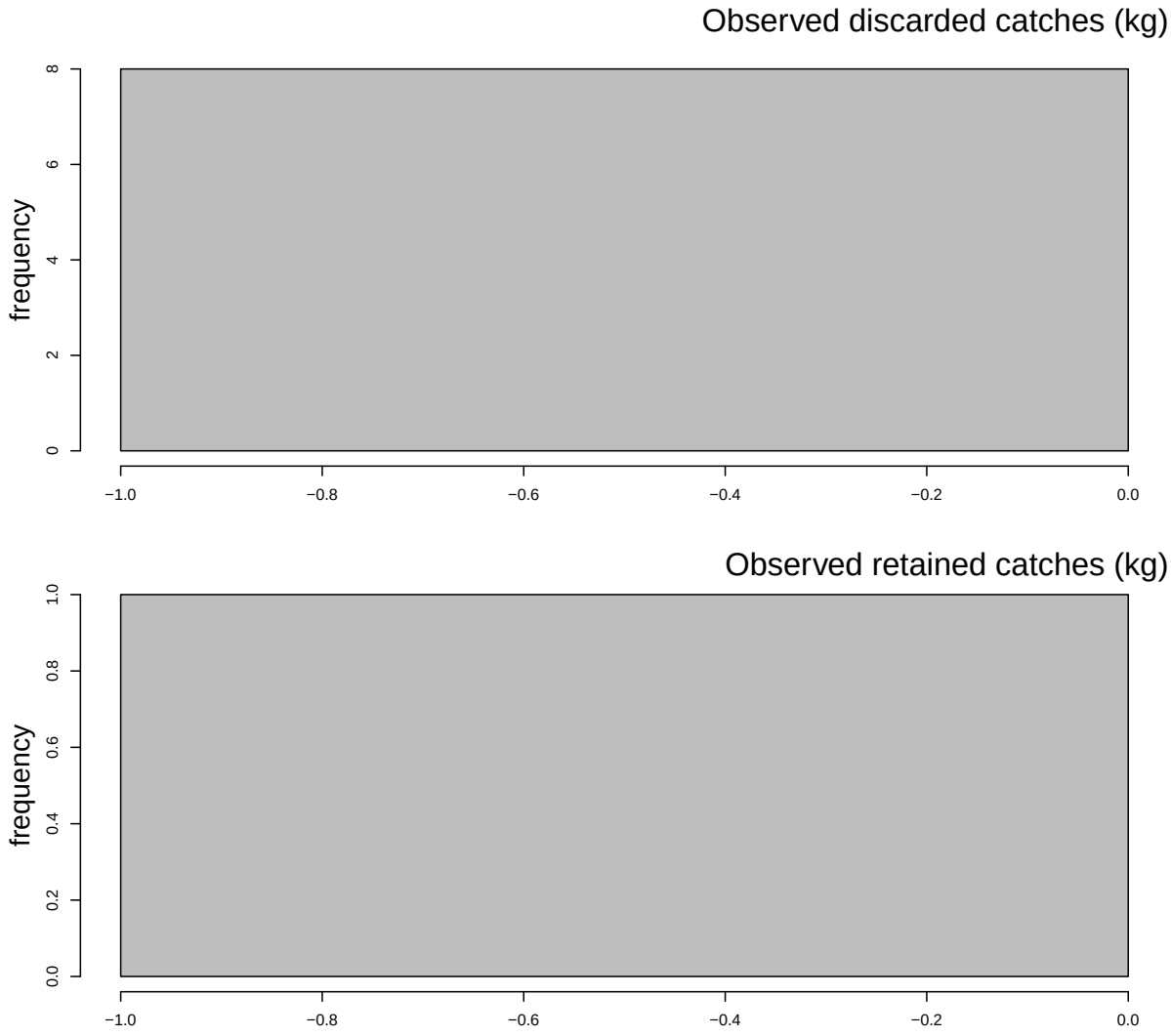

Figure 4.41: Histograms of observed discarded (top) and retained (bottom) catch weights for Deepwater Flathead in 2019. For more information contact AFMA on (02) 6225 5555.

Table 45: School Shark: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	0.01		1		1475				
TR_NSW_OFF					597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	11.27	26	244	10.66	1895	2.65	0.25	1.27	0.1
DS_EDL	0.11		22		8867				
TR_EDL_IN	0.28	3	39	7.69	3341	1.67	0.03	0.19	0.4
TR_EDL_OFF	1.44	5	41	12.2	1573	21.37	0.12	3.91	0.73
TR_TAS_BGS					580				
TR_TAS_E	1.47	7	88	7.95	2590	19.57	0.03	1.4	0.49
TR_TAS_ORO					27				
TR_TAS_W	11.78	25	157	15.92	1081	12.64	0.14	1.88	0.14
TR_BS_IN	0		2		40				
TR_ECDW					14				
AL_CSA	63.6		878		1572				
AL_ESA	6.84		169		507				
AL_WBS_SAV	4.09		95		358				
AL_EBS_NSW	1.32		19		510				
AL_ET_WT	11.42	28	219	12.79	598	17.05	0.9	9.21	0.45
AL_WSA_WA	21.8		170		279				
GN_CSA	3.76		188		328				
GN_ESA	1.23		53		98				
GN_SAV	4.89		157		482				
GN_WBS	22.8		594		1514				
GN_EBS_NSW	19.21		911		3565				
GN_ET_WT	11.22		162		539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	198.54	94	0		33330			17.86	0.32

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

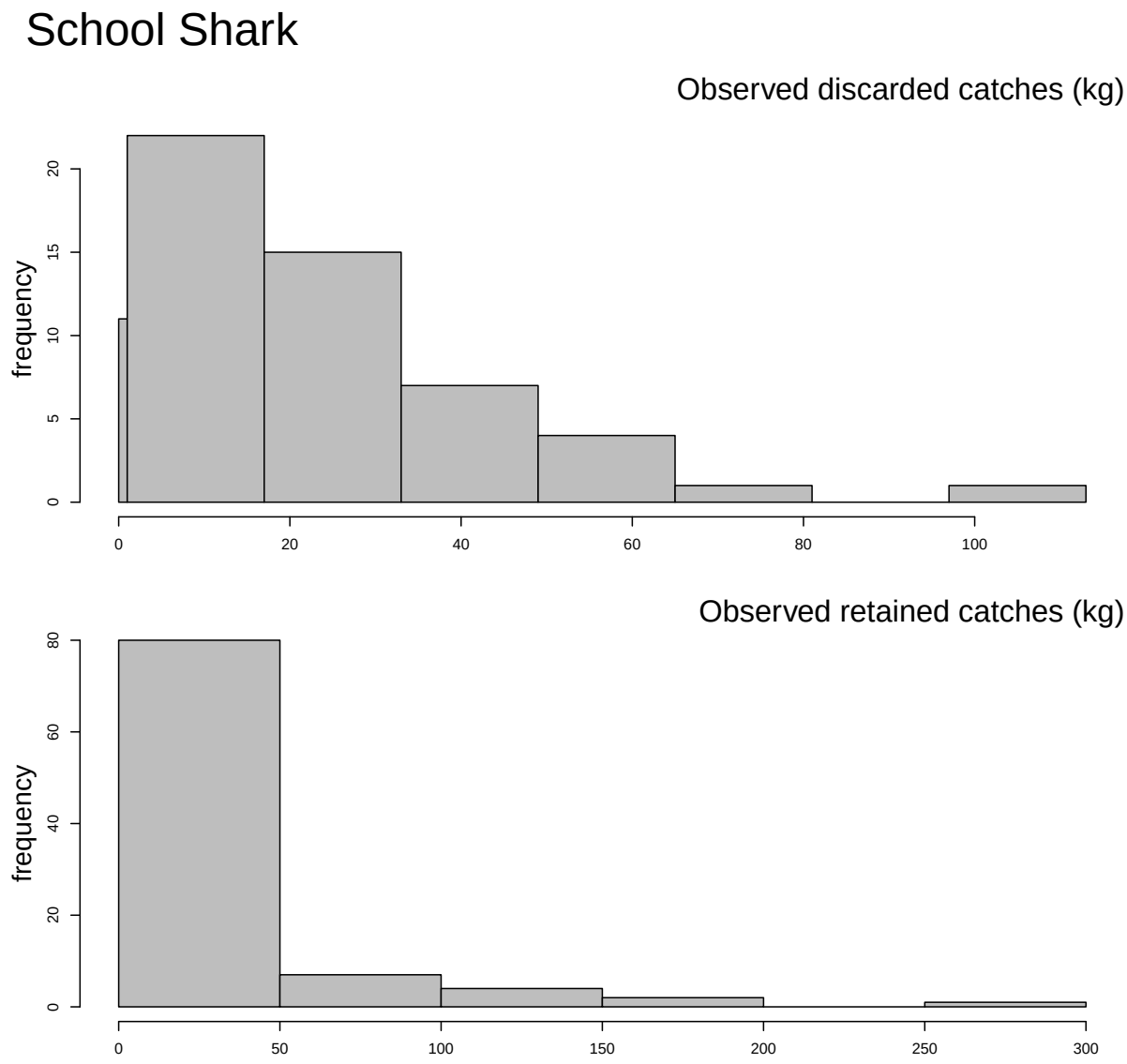

Figure 4.42: Histograms of observed discarded (top) and retained (bottom) catch weights for School Shark in 2019. For more information contact AFMA on (02) 6225 5555.

Table 46: Gummy Shark: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	2.53	16	126	12.7	1475	0.71	0.26	0.27	0.1
TR_NSW_OFF	1.03	3	30	10	597	0	0.16	0	0
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	10.98	29	256	11.33	1895	4.83	0.28	2.58	0.19
DS_EDL	30.52	38	2134	1.78	8867	13.78	0.33	40.73	0.57
TR_EDL_IN	16.66	44	805	5.47	3341	4.91	0.49	8.02	0.32
TR_EDL_OFF	9.56	14	265	5.28	1573	7.92	0.33	4.06	0.3
TR_TAS_BGS					580				
TR_TAS_E	16.78	52	588	8.84	2590	4.38	0.2	2.32	0.12
TR_TAS_ORO					27				
TR_TAS_W	1.9	6	68	8.82	1081	0	0.03	0	0
TR_BS_IN	0.05		7		40				
TR_ECDW					14				
AL_CSA	276.95		1534		1572				
AL_ESA	48.41		471		507				
AL_WBS_SAV	33.78		298		358				
AL_EBS_NSW	64.06		346		510				
AL_ET_WT	42.93	2	382	0.52	598	0	0.06	0	0
AL_WSA_WA	30.73		244		279				
GN_CSA	29.85		327		328				
GN_ESA	5.4		97		98				
GN_SAV	30.22		476		482				
GN_WBS	185.86		1496		1514				
GN_EBS_NSW	729.66		3540		3565				
GN_ET_WT	69.94		532		539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	1637.8	204	0		33330			57.98	0.3

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

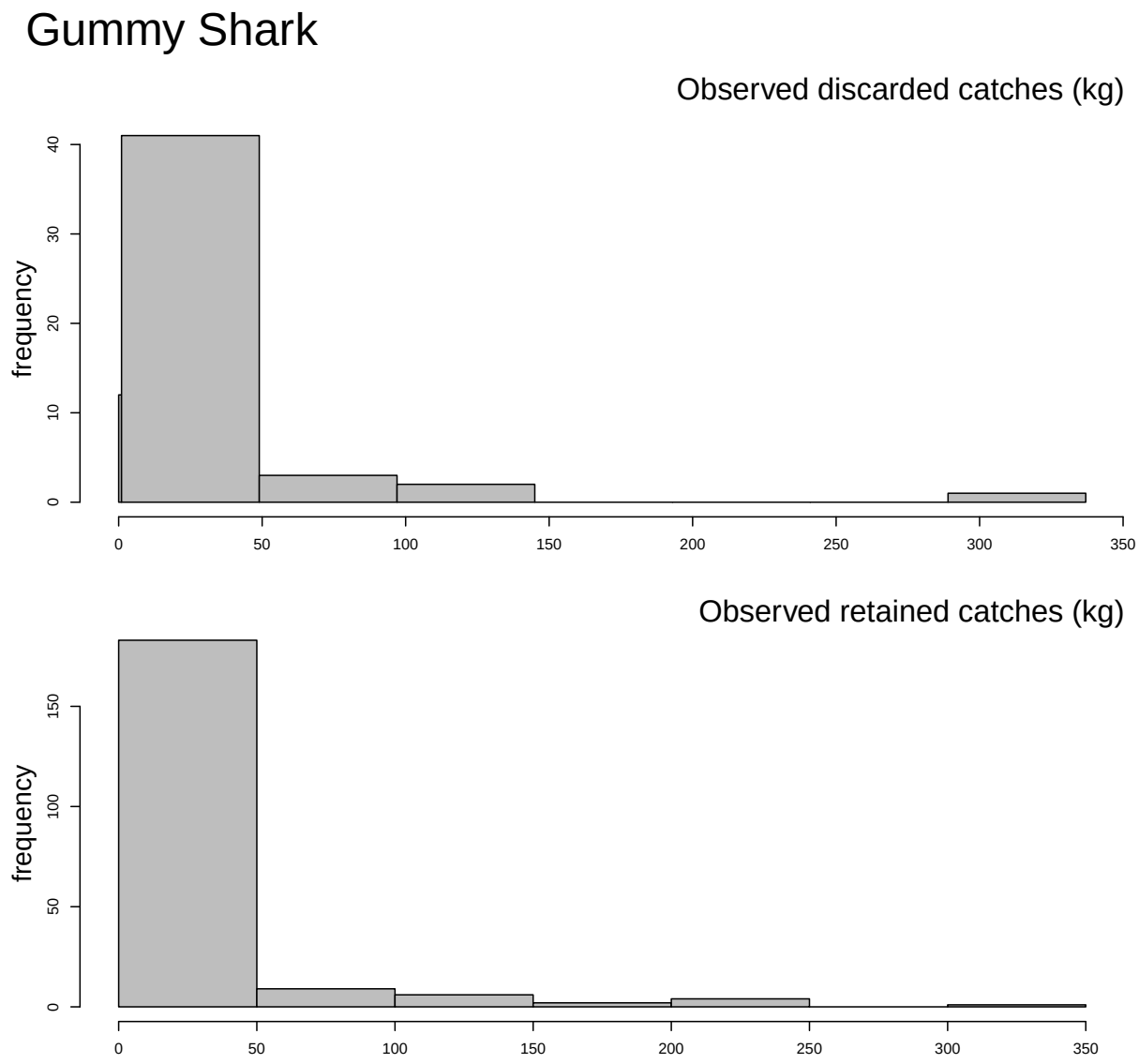

Figure 4.43: Histograms of observed discarded (top) and retained (bottom) catch weights for Gummy Shark in 2019. For more information contact AFMA on (02) 6225 5555.

Table 47: Saw Shark: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	14.71	38	495	7.68	1475	8.56	0.62	7.86	0.35
TR_NSW_OFF	5	6	70	8.57	597	1.87	0.32	0.35	0.07
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	12.4	21	235	8.94	1895	4.02	0.2	1.55	0.11
DS_EDL	17.49	46	1932	2.38	8867	2.11	0.4	7.56	0.3
TR_EDL_IN	12.9	25	761	3.29	3341	2.18	0.28	2.02	0.14
TR_EDL_OFF	2.13	5	92	5.43	1573	1.26	0.12	0.23	0.1
TR_TAS_BGS					580				
TR_TAS_E	1.34	5	130	3.85	2590	1.09	0.02	0.06	0.04
TR_TAS_ORO					27				
TR_TAS_W	0.45	2	21	9.52	1081	0	0.01	0	0
TR_BS_IN	0.04		4		40				
TR_ECDW					14				
AL_CSA	0.6		147		1572				
AL_ESA	0.39		20		507				
AL_WBS_SAV	0.08		24		358				
AL_EBS_NSW	0.03		8		510				
AL_ET_WT	0.01		5		598				
AL_WSA_WA	0.14		19		279				
GN_CSA	0.85		129		328				
GN_ESA	0.64		40		98				
GN_SAV	6.62		363		482				
GN_WBS	22.89		1128		1514				
GN_EBS_NSW	53.59		2527		3565				
GN_ET_WT	1.41		239		539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	153.71	148	0		33330			19.63	0.23

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

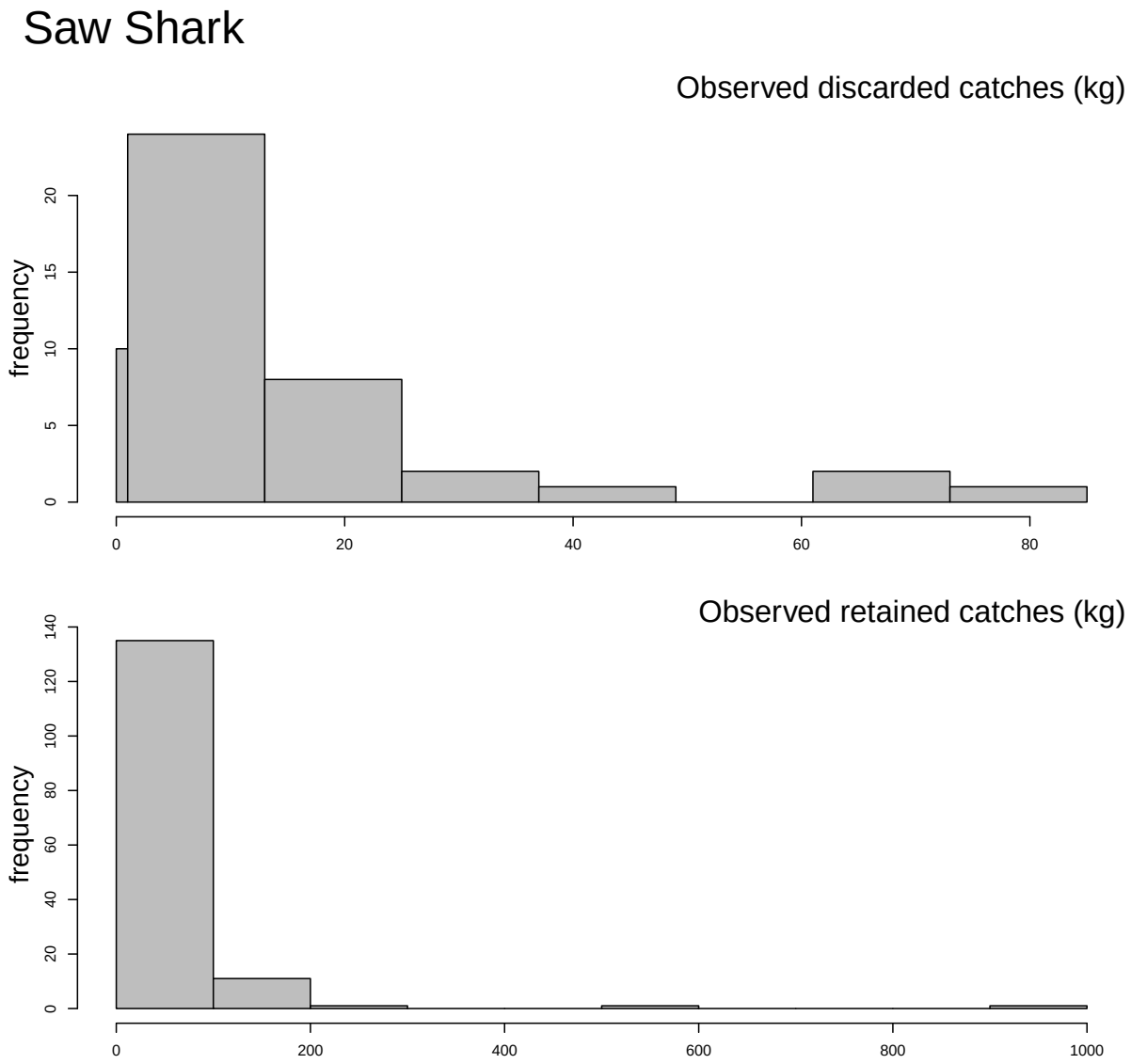

Figure 4.44: Histograms of observed discarded (top) and retained (bottom) catch weights for Saw Shark in 2019. For more information contact AFMA on (02) 6225 5555.

Table 48: Elephantfish: 2019 logbook landings, numbers of observed shots (Nobs) , numbers of logbook shots per species (NlogSp) and per strata (NlogStra), percent observed (Obs perc), hit rate, mean discard per shot (D/shot), estimated discarded tons (Dlog) and discard rate (Disc rate).

Stratum	Landings (t)	Nobs	NlogSp	Obs perc	NlogStra	D/shot (kg)	Hit rate	Dlog (t)	Disc rate
TR_NSW_GEM					96				
TR_NSW_IN	0		1		1475				
TR_NSW_OFF	0		1		597				
TR_NSW_RRP					201				
TR_SW_BGS					157				
TR_SW_ORO									
TR_SW	1.1	4	38	10.53	1895	0	0.04	0	0
DS_EDL	6.88	7	623	1.12	8867	26.53	0.06	14.45	0.68
TR_EDL_IN	3.65	12	181	6.63	3341	22.01	0.13	9.8	0.73
TR_EDL_OFF	0.2	3	11	27.27	1573	30.57	0.07	3.36	0.94
TR_TAS_BGS					580				
TR_TAS_E	2.45	13	112	11.61	2590	1.11	0.05	0.15	0.06
TR_TAS_ORO					27				
TR_TAS_W	0.86	2	21	9.52	1081	0	0.01	0	0
TR_BS_IN					40				
TR_ECDW					14				
AL_CSA	0		3		1572				
AL_ESA					507				
AL_WBS_SAV	0		1		358				
AL_EBS_NSW	0.04		9		510				
AL_ET_WT	0.01		4		598				
AL_WSA_WA					279				
GN_CSA	0.02		8		328				
GN_ESA	0.06		18		98				
GN_SAV	0.36		128		482				
GN_WBS	7.3		581		1514				
GN_EBS_NSW	18.37		1132		3565				
GN_ET_WT	2.64		164		539				
GN_WA_WSA									
TR_CAS_ORO					18				
TR_MAA_ORO									
TR_PED_ORO									
TR_SHH_ORO					126				
TR_SPH_ORO					43				
TR_TAS_E_DWS					47				
TR_TAS_W_DWS					212				
Total	43.94	41	0		33330			27.76	0.65

[1] "Note that the estimated discarded catch weights presented in this report are calculated from logbook catch estimates and therefore do not match those provided in Althaus et al. (2020) which are scaled to the CDR catch."

Elephantfish

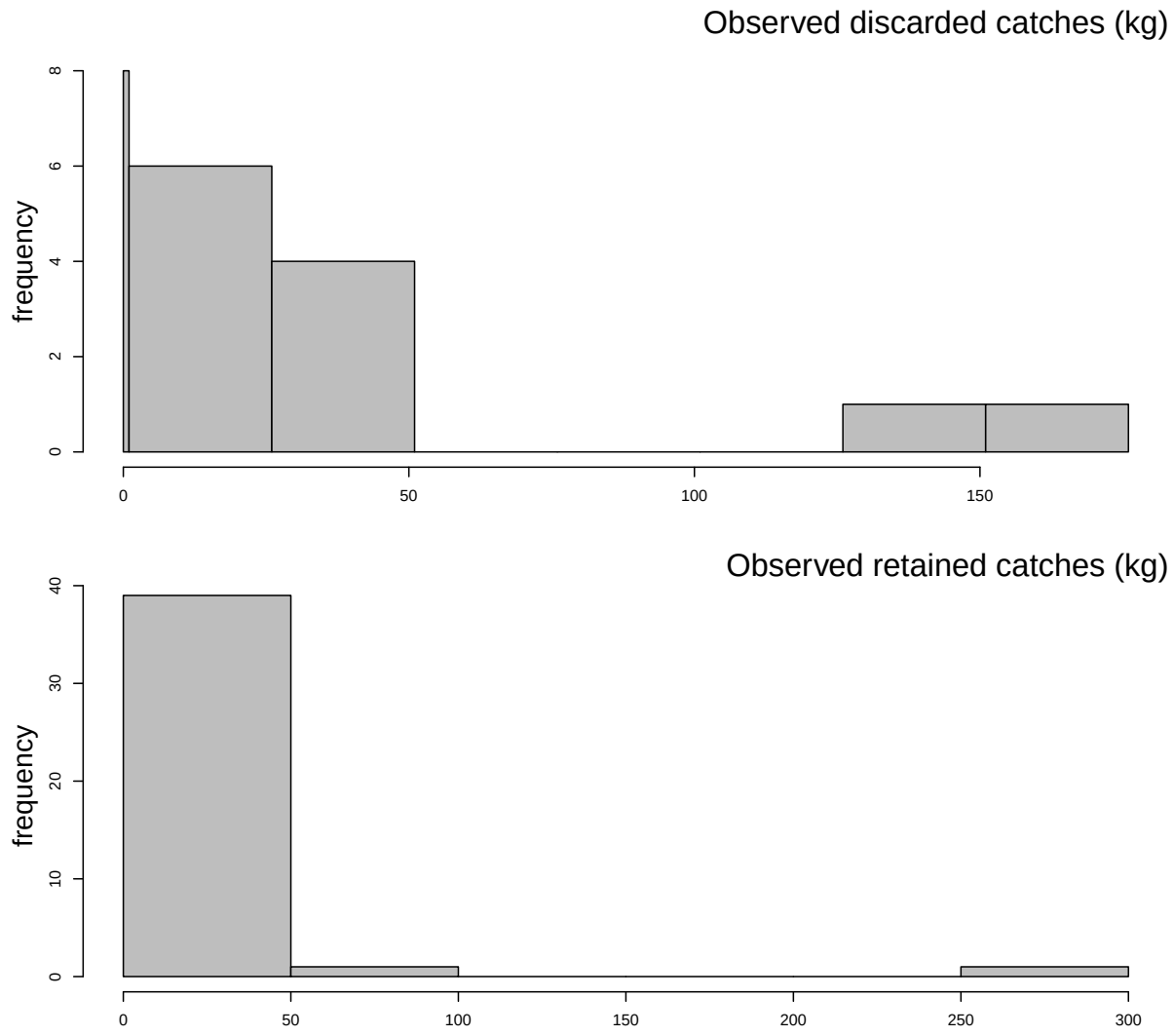

Figure 4.45: Histograms of observed discarded (top) and retained (bottom) catch weights for Elephantfish in 2019. For more information contact AFMA on (02) 6225 5555.

5 Discussion

In addition to the work requested by SESSFRAG in 2018 there are now eight full years of data have now been collected under the current ISMP design (although adherence to the PROP design has not always been good). The robustness of discard estimates using the current design based approach (Bergh et al., 2009) dependent on good adherence to the sampling plan. A model based approach to estimating discarded catch may be preferable due to its potential to fill in gaps in the sampling for individual years.

6 Appendix A: Changes prior to 2020

This appendix describes the changes made to the Discard report in 2018 and 2019.

6.1 Changes made in 2019

The following changes have been made in Deng et al. (2019b) compared with the 2018 version (Burch et al., 2018).

1. Strata where only one shot is observed are excluded from the calculation of discarded catch. This was done because when only one shot is observed the variance is undefined and it was desirable to use the same data for the discard estimate and its variance.
2. The hit rate, the proportion of shots that encounter the species, has replaced the mean proportion discarded in the species specific summaries (Tables 4-48). These tables have new columns that show the number of logbook shots pre stratum and the discard rate.
3. Histograms of observed discarded catches are provided for each species group to assist in the identification of outliers. These histograms also include the number of observed shots with zero discards.
4. The validity rule has been expanded to reject discard estimates with discard CV's greater than 100% (recommendation of the August 2019 SESSFRAG Data Meeting).

The 2019 report investigated the calculation of discard rates and CVs and the data selection rules. The main difference between the 2018 report (Burch et al., 2018) and 2017 report (Thomson et al., 2018) is the inclusion of both the CVs for the total and discarded catch provided in Tables 2 and 3 of this report.

In addition to the change described above two other changes were made to this report in 2018, some of which resulted in minor changes in discard rate estimates compared with Thomson et al. (2018), these are outlined below.

- AFMA have made substantial corrections to several years of the observer data used in estimating discard rates.
- The percentage of logbook shots that caught the species of interest that were taken in strata that had at least 5 observed shots (Shot % (≥ 5) Tables 2 and 3) now, more correctly, uses total logbook shots in the denominator, whereas last years report used logbook shots in only those strata which had been observed. This change resulted in reductions to Shot % (≥ 5), however, most species groups remain above 50%.

6.2 Changes made in 2018

The following changes were made in the 2017 version of this report and have been retained in subsequent reports.

- During 2017 it became apparent that separate Tier 4 analyses are applied to eastern and western components of some species that have previously been lumped for both discards and catch calculations. To aid in the smooth automation of Tier 4 calculations, discards for Jackass Morwong, Blue Warehou, Pink Ling, Mirror Dory and Deepwater shark are presented separately for those east and west of 147 longitude. A consequence of this is that the CVs for these species are all above 40%.
- Discards in the Great Australian Bight (GAB) strata are now excluded from the estimation of discards except for Bight Redfish, Deepwater Flathead and GAB Orange Roughy.

- The VIT (Victorian Inshore Trawl) stratum has been removed from the tables because AFMA observers no longer use it in reporting ISMP data (Nick Mammides pers. comm.).
- The decision was made during the 2017 SESSFRAG Data meeting to slightly alter the stratum definitions used in the discard calculations to match those used by the ISMP when setting target sea days. Consequently a new stratum (TR_NSW_GEM) has been added to account for New South Wales Gemfish trawl observations.

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