Dusky Flathead (*Platycephalus fuscus*)

Stock Structure and Biology

Dusky Flathead are predominantly an estuarine species captured by commercial fishers in Gippsland Lakes and by recreational anglers in the estuaries of eastern Victoria. Contrary to the popular belief that Dusky Flathead are protandrous and change sex from male to female, studies have found that they are rudimentary hermaphrodites with sex determined at an early juvenile stage (Pollock, 2014). Females do, however, grow much larger than males. This species lives to at least 16 years of age (Gray and Barnes, 2015), though there are no published studies of the age of this species at its maximum reported size. Dusky Flathead have a protracted spawning period throughout summer, with multiple spawning events taking place near the entrance of estuaries (Pollock, 2014; Gray and Barnes, 2015). The relatively short lifespan for this species coupled with potentially high, albeit highly variable, fecundity implies that environmental conditions will have the greatest influence over recruitment to the stock (Hicks et al. 2015).

Management/Assessment Unit

Dusky flathead predominantly inhabits estuaries, with each estuary likely to support a relatively isolated stock. Considering their isolation, each estuary for which data are available is assessed independently. Commercial harvests, which have now ceased, had been restricted to Gippsland Lakes since the creation of recreational only fishing reserves in Mallacoota Inlet in 2004 and Lake Tyers in 2007 (Figure 94). The 20-year time series of data available does not rule out a decadal cycle given the pattern of recruitment expected under natural, unfished, conditions. Under these circumstances, future performance of the stock will remain uncertain until there is a much longer time series available for assessment.

Assessment Summary

The performance of the CPUE biomass proxies were assessed in relation to their average and minimum values during the reference period 1999–2015 for commercial fishing in Gippsland Lakes, and during 1999–2015 for creel or angler diary surveys undertaken in Gippsland Lakes, Lake Tyers, and Mallacoota Inlet.

Gippsland Lakes

This assessment found:

- *Fishing pressure* – Dusky flathead have historically been a by-product of commercial fishers targeting more valuable species with landings remaining around 10–20 t for the last few years (Figure 94), as they have been solely taken from Gippsland Lakes since the buyout of commercial licences from other estuarine commercial fisheries. Mesh netting effort in Gippsland Lakes is currently at about half of historic high values that occurred in the 1980s and seining effort is at historic low values (see Appendix 2). There is some indication that dusky flathead has been targeted commercially in Gippsland Lakes since the mid-2000s, possibly as a response to reduced availability of black bream.

- *Biomass* – Mesh net commercial CPUE increased during the 2000s, reaching a maximum in the mid-2000s that was well above the reference period average, before declining again to levels similar to the start of the series close to the reference period minimum. There was a moderate increase towards the end of this CPUE series (Figure 96). Despite its limitations in coverage i.e. low number of observations outside the period 2006 - 2010, and absence of data in 2011 in 12, CPUE from recreational anglers showed a clearly declining trend over almost two decades from well above the reference period average to below the minimum for that reference period (Figure 96).

Stock status summary: Current levels of fishing pressure (both mesh net and seine) are below historic highs. Mesh net CPUE remains around halfway between the reference period average and the minimum suggesting that the stock is within historic bounds. Notwithstanding the overall trend in angler diarist CPUE, and bearing in mind the limited observations, the pattern among recent nominal values has been relatively stable around the minimum. However, with the impending closure of the commercial fishery future data available to assess this species will be limited to diary angler and creel surveys which currently lack coverage for dusky flathead in Gippsland Lakes. These most recent data suggest that although the future is uncertain, there is some expectation that given the life history characteristics of dusky flathead and an absence of commercial fishing, further recruitment to the stock is likely when environmental conditions are favourable. Based on the above summary the Victorian Gippsland Lakes dusky flathead stock is depleting.

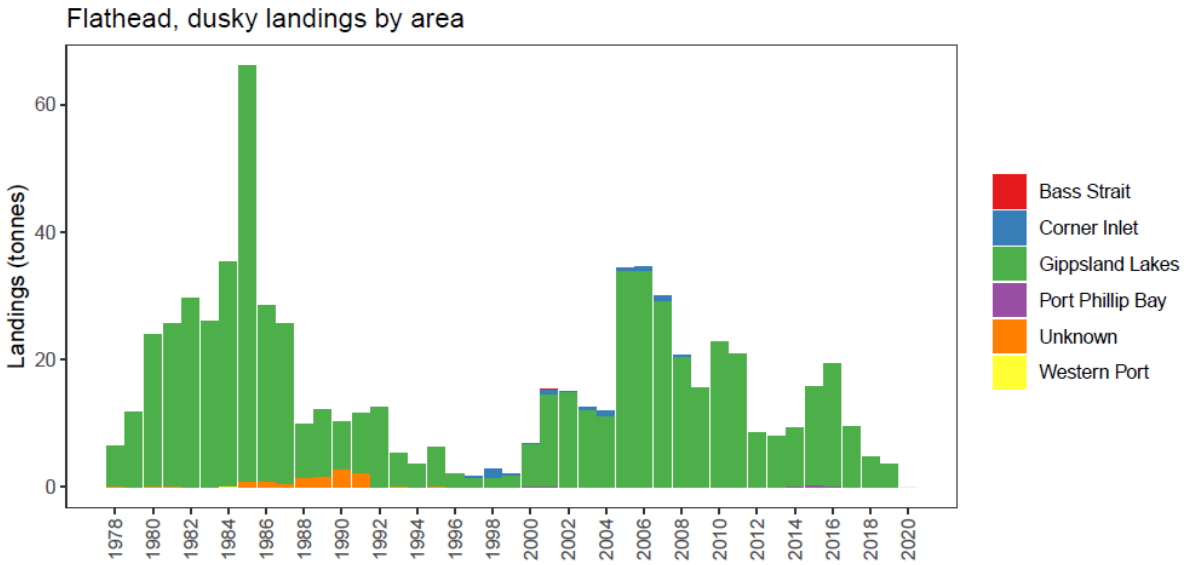


Figure 94 Total catch of dusky flathead from Gippsland Lakes by gear type, financial years 1978–2020. Note: Commercial harvests have been restricted to the Gippsland Lakes since creation of recreational only estuaries in Lake Tyers in 2007 and Mallacoota Inlet in 2004.

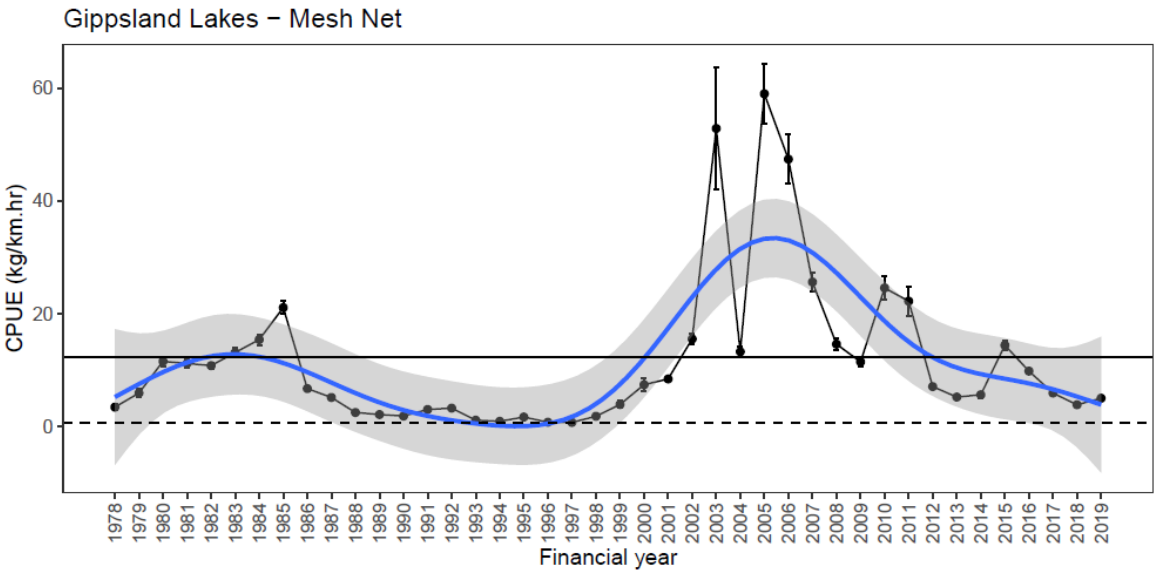


Figure 95 Dusky flathead nominal Catch-per-unit-effort (CPUE) (±SE) for a) for commercial mesh netting in Gippsland Lakes (1978–2019 financial years). Mesh net CPUE y-axis units are kg/km as fishing time was not recorded time prior to 1998. Horizontal black line is the mean CPUE during the reference period (1985–2015) and the dashed black line is the minimum CPUE within the reference period. Blue line is a generalised additive model (GAM) of the nominal CPUE trend with the shaded grey area representing the 95% confidence interval of the GAM.

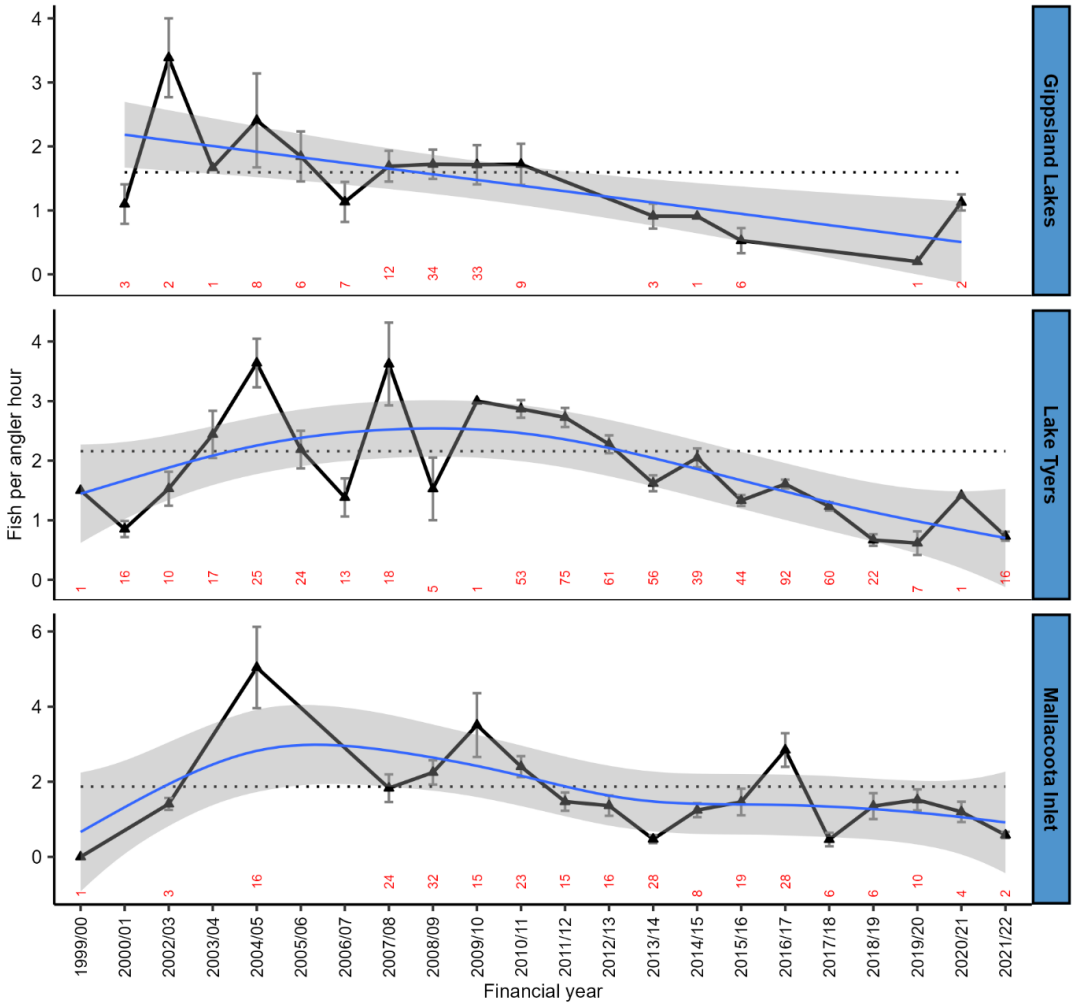


Figure 96 Dusky flathead nominal angler diarist catch-per-unit-effort (CPUE) (±SE) for the Gippsland Lakes, Lake Tyers and Mallacoota Inlet (1999/00–2021/22 financial years). Horizontal dotted black line is the mean CPUE during the reference period (1985–2015). Blue line is a generalised additive model (GAM) of the nominal CPUE trend with the shaded grey area representing the 95% confidence interval of the GAM.

Mallacoota

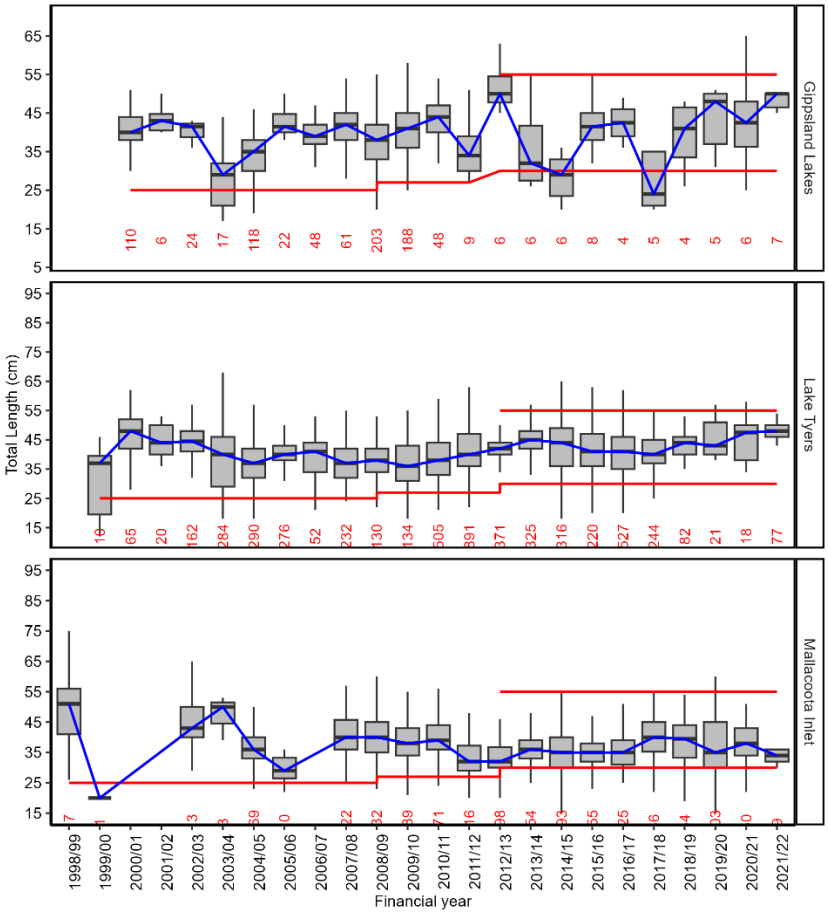
This assessment found:

- *Fishing pressure* – There is no direct measure of fishing pressure for dusky flathead in the Mallacoota estuarine system. There is some possibility that fishing mortality may be relatively high given there is a lack of very large dusky flathead in all years of the length frequency sample (Figure 97b) and the median size, and upper quantile, have declined since the late 1990s and early 2000s (Figure 97a).
- *Biomass* – There has been a variable, but increasing, trend in angler diarist CPUE during the first 5 years of the time series followed by five years at levels at or above the reference period average, before a decline since 2009 to level out at bit over one third of the rate during the preceding five years (Figure 96 lower panel) (Hamer et al 2019).

Stock status summary: The higher levels of CPUE during 2004–2009 from angler diarists fishing for dusky flathead at Mallacoota was likely reflective of a strong recruitment event. The time series is not long enough to determine if this is part of the boom-bust cycle of recruitment which characterises this species (Hamer et al 2019; Hicks et al. 2015) or represents an ongoing depleted state in which recruitment has become impaired due to changing environmental conditions. The fishing slot introduced in 2010 is regarded as generally protecting female spawning biomass from fishing and the relatively short lifespan coupled with potentially high, albeit highly variable, fecundity implies that environmental change poses the greatest threat to the stock. Although the last decade shows a pattern of depletion, this is inconclusive as the 20-year time series does not rule out a decadal cycle. Under these circumstances stock status, at least in terms of future performance, remains uncertain.

Catches have predominantly been comprised of smaller fish due the main diary angler mostly targeting bream. The diary angler CPUE is not thought to represent larger female fish, and the status of the important large female component is uncertain. While increasing use of soft plastics could be masking reductions in biomass and may explain the increasing temporal trend in CPUE, it is reasonable to assume that this would not be affecting the trend during the last 5 – 10 years and that the component of the stock within the ‘slot limit’ range (i.e. 30–55 cm) is relatively stable or increasing. There is, however, some risk that fishing mortality may be too high given relatively few very large individuals are now caught. While the relative consistency of small individuals throughout the time series suggests that recruitment is relatively consistent and remains unimpaired, it may possible that growth overfishing is occurring. Growth overfishing will only reduce angling success and not compromise the sustainability of the stock.

(a)



(b)

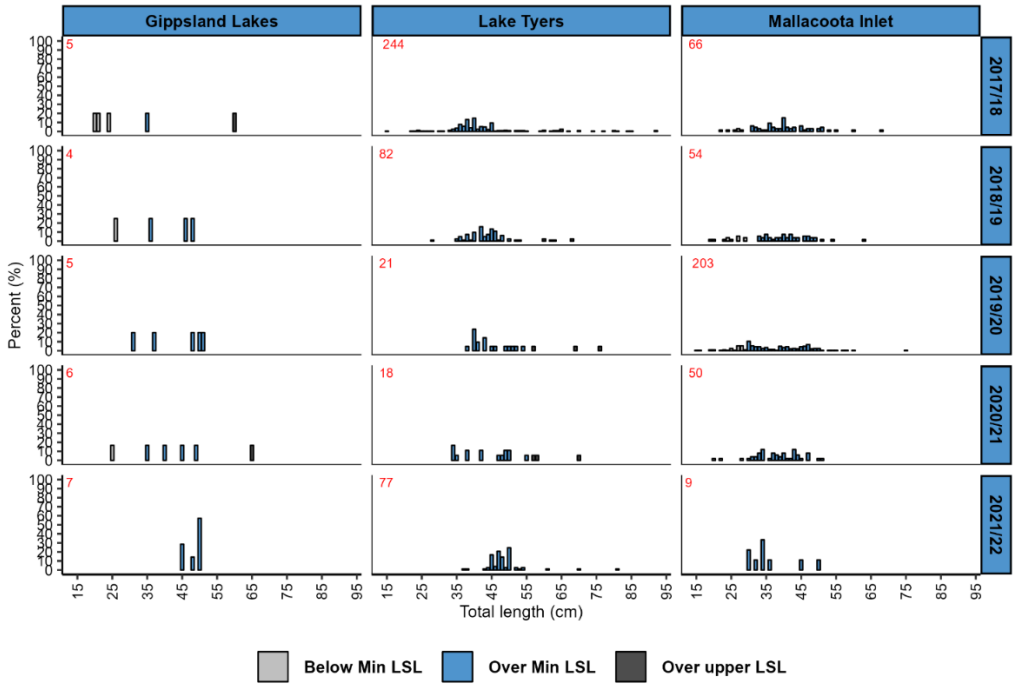


Figure 97 (a) Box-plots of Gippsland Lakes, Lake Tyers and Mallacoota Inlet dusky flathead length composition from diary anglers for financial years 1998/99-2021/22. Red numbers on x-axis indicate numbers of fish sampled. Blue line = median length, red line = lower and upper legal size limits. (b) Frequency histograms of Gippsland Lakes, Lake Tyers and Mallacoota Inlet dusky flathead length composition from diary anglers for fiscal years 2017/18-2021/22. Red numbers indicate numbers of fish measured.

Lake Tyers

This assessment found:

- *Fishing pressure* – There is no direct measure for fishing pressure in the Lake Tyers dusky flathead fishery. Based on the size composition of the angler diarists catches, there has been no long-term change in the median, or range, of sizes (Figure 99). Additionally, large individuals are present in the catch suggesting that fishing mortality is low enough to enable some females to grow through the slot limit and gain protection (Figure 99).
- *Biomass* – The CPUE of angler diarists for dusky flathead in Lake Tyers increased from 1999 – 2004 and was highly variable throughout the 2000s. From 2010 there was a consistent decline in catch rate from around 2.5 fish per hour to less than 1.0 fish per hour (Figure 98). Juveniles were present in the catch during each year suggesting recruitment has been consistent and is ongoing.

Stock status summary: The CPUE of angler diarists reduced to less than a quarter by 2018 of what it was in 2010. Although the large sample size during this period represents many more trips per diarist there was only a weakly positive relationship (20% association) between the trip count and CPUE, and there have been no major changes in fishing practices. This and the low variability in the estimates due to the large number of trips, implies that CPUE since 2010 is likely to be relatively representative of actual stock biomass. The size frequency of the catch has remained consistent and included both very large and very small fish, indicating that fishing mortality has not been so high as to prevent females from growing through the slot limit. Despite the decline in CPUE and it approaching the minimum value observed during the reference period, there is evidence for recent recruitment in the length frequency data. Based on this evidence the Lake Tyers dusky flathead stock is considered to be sustainable. The likelihood of recruitment impairment is low with the main risk being that heavy fishing pressure may limit catches until a subsequent cohort recruits to the stock.

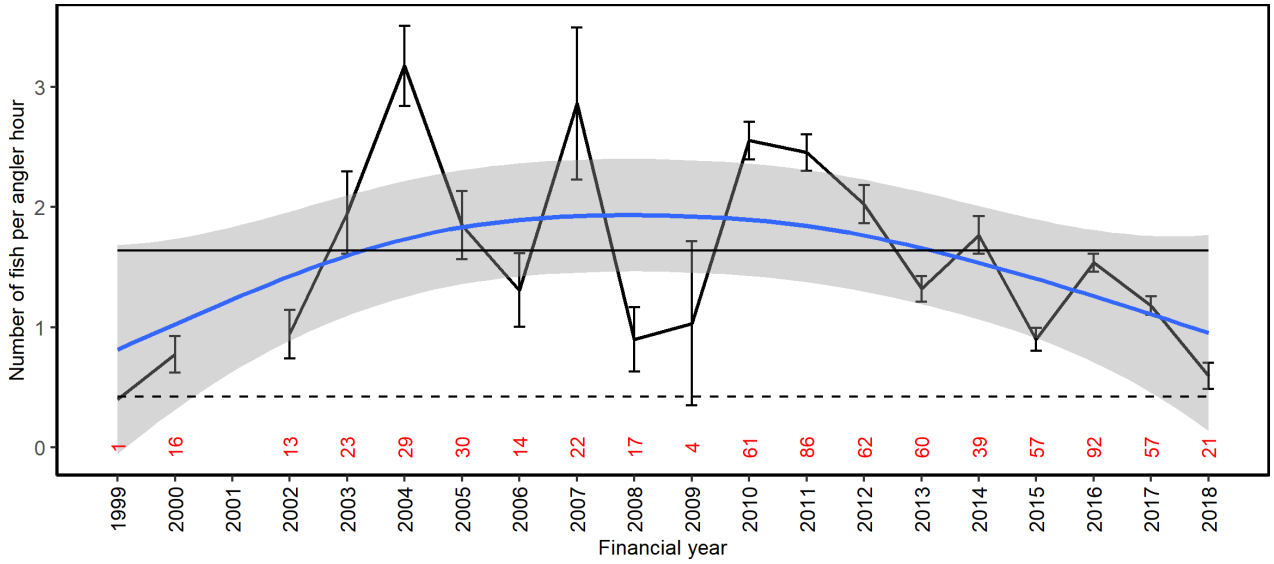


Figure 98 Nominal Catch-per-unit-effort (CPUE) (±SE) of dusky flathead for diary anglers in Lake Tyers (1999–2018 financial years). Horizontal black line is the mean CPUE during the reference period (1999–2015) and the dashed black line is the minimum CPUE within the reference period. Blue line is a generalised additive model (GAM) of the nominal CPUE trend with the shaded grey area representing the 95% confidence interval of the GAM. Red numbers along x-axis are numbers of diary angler trips.

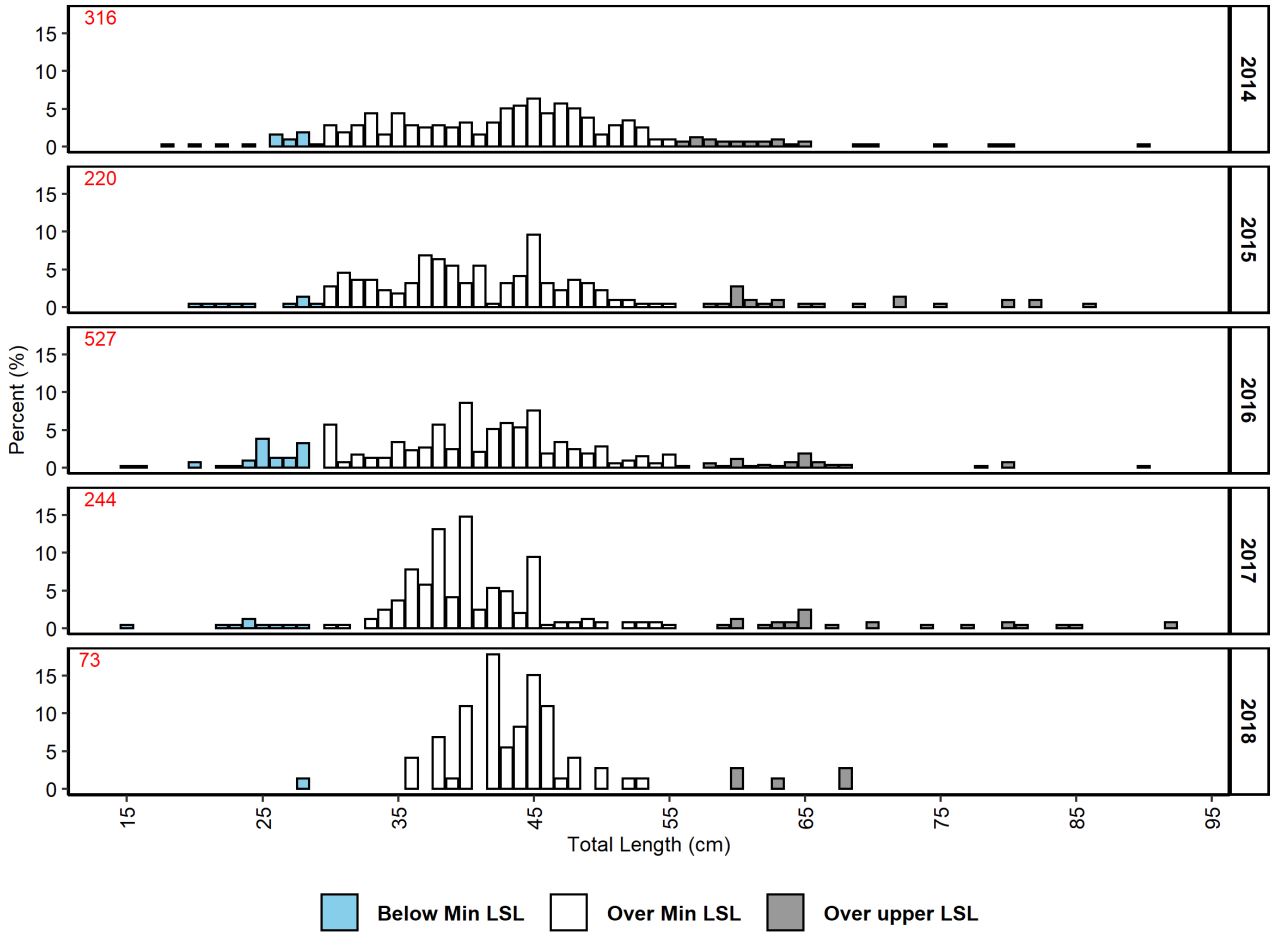


Figure 99 Frequency histograms of Lake Tyers dusky flathead length composition from diary anglers for financial years 2013–2018. Red numbers indicate numbers of fish measured.