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Estimating Recreational Abalone Harvest Using Length-Weight Data from Commercial Catch Sampling

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By

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1 Background

Effort in the recreational abalone fishery is managed by daily limits, and until the 2019/2020 recreational fishing season the daily bag limit was set at a maximum of 10 abalone/licence/day, with a possession limit of 20 at any point in time. From 2010 to 2019 persistent declines in the commercial abalone fishery catch and catch rate were observed despite multiple decreases in the commercial TACC. Commercial CPUE is used as the sole proxy for biomass of the abalone resource, on the basis that the recreational catch is both small and difficult to accurately quantify. In 2019, a recommendation for closure of five key areas of the Tasmanian East Coast commercial blacklip abalone fishery was accepted. Similarly a reduction (but not closure) of the recreational bag limit to five abalone/licence/day was recommended and accepted to assist with recovery, and minimizing further risk of depletion of the abalone in key recreational fishing regions along the East Coast.

In November 2021, the Tasmanian Legislative Council rescinded the five-bag limit regulation, with an immediate return to the 2018/2019 recreational abalone fishery regulations and limits. As part of the motivation for the reversal of the bag limit reduction, it was argued that size limits were the most important management lever available, and that no efforts had been made to consider and/or implement increases in the size limit governing the recreational abalone fishery.

Here we explore the consequences of increases in the recreational abalone size limit on Tasmania's East Coast on the magnitude of the recreational abalone fishery harvest.

2 Estimate Recreational harvest for by mean weight

Recreational abalone harvest has been routinely estimated by a phone-diary survey involving a random sample of license-holders since 1996. Participants record details of their fishing activity including date, location, method used, target species, start and finish times, and the number of abalone kept (harvested) for the survey period 1st November to 30th April the following year and thus only provide a partial season estimate. Data from respondents are then expanded to estimate the catch (number of abalone harvested) and effort of the entire recreational licensed population using a 'bootstrapping' method to estimate 95% confidence limits using the percentile method. Estimated harvest weight (kg) is then estimated by multiplying the harvest number by the average weight of an individual abalone for each area based on commercial catch sampling data collected prior to 2018 (area 1 = 522 g, area 2 = 517 g, area 3 = 520 g) (Lyle et al. 2021).

The estimated combined east coast (areas 1-3) blacklip abalone recreational harvest number for 2020-21 was n = 22882 (95% CI 12774-34777) (area 1 = 11756, area 2 = 9919, area 3 = 1207) (Lyle et al. 2021). In 2020-21 this equates to 11916 kg (11.9 t) (see Table 6 in Lyle et al. 2021).

The estimated combined east coast (areas 1-3) blacklip abalone recreational harvest number for 2018-19 was n = 25671 (95% CI 13728-37139) (area 1 = 20339, area 2 = 2365, area 3 = 2967) (Lyle et al. 2019). In 2018-19 this equates to 13167 kg (13.2 t) (see Table 6 in Lyle et al. 2019).

The following code have been developed to utilise the most recent data collected from the commercial abalone catch sampling program between 2019-2021.

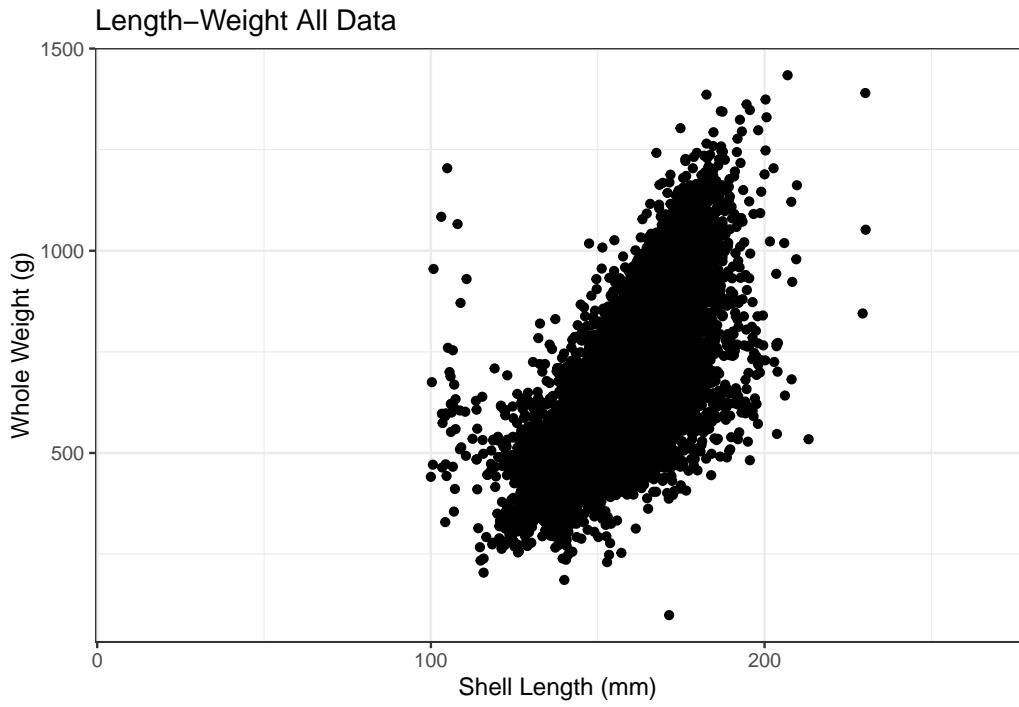


Figure 1: Length-weight relationship of commercial abalone catch sampling data for all zones collected between 2019-2021.

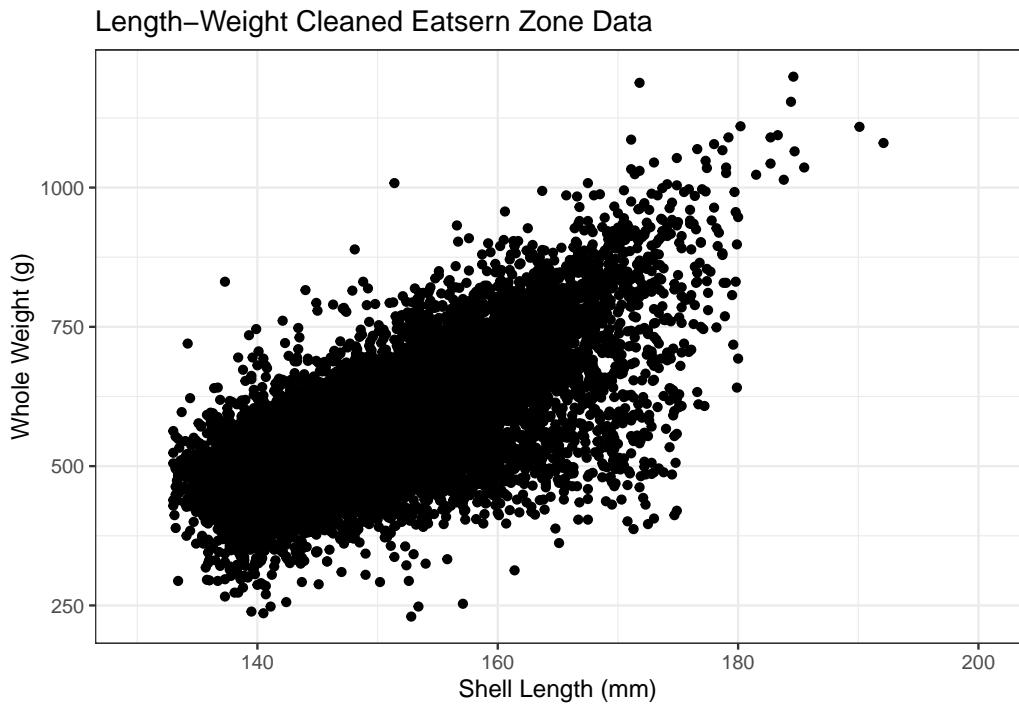


Figure 2: Length-weight relationship of cleaned commercial abalone catch sampling data for the eastern zone collected between 2019-2021.

Table 1: Average weight of individual abalone from commerical abalone catch sampling data for all zones collected between 2019-2021.

Zone	Av.weight(g)	n	Catches
BS	402.0413	339	4
E	557.8497	15838	165
G	662.9899	296	3
N	486.2810	630	6
W	692.6604	15145	158

3 Estimate recreational harvest weight for east coast based on mean weight of individual abalone from commerical catch sampling for the eastern zone

Table 2: Estimated Recreational harvest based on average weight of individual abalone from commerical catch sampling for the eastern zone collected between 2019-2021.

Av.weight(g)	Harvest 18/19(kg)	Harvest 20/21(kg)
557.8497	14320.56	12764.72

4 Estimate Recreational harvest based on length-weight relationship

Table 3: Estimated length-weight model parameters from commerical abalone catch sampling data for all zones collected between 2019-2021.

Zone	a	b
BS	0.0021595	2.474915
E	0.0099341	2.182369
G	0.0000692	3.162481
N	0.0013457	2.585293
W	0.0028179	2.448732

Table 4: Estimated Recreational harvest for each LML based on estimated harvest for 2020-21 season and abalone length-weight relationship from commerical catch sampling for the eastern zone collected between 2019-2021.

LML	Est. weight(g)	Harvest(kg)	Harvest 95%(kg)	Harvest 90%(kg)
138	464.6605	10632.36	10100.74	9569.126
140	479.4831	10971.53	10422.96	9874.379

LML	Est. weight(g)	Harvest(kg)	Harvest 95%(kg)	Harvest 90%(kg)
145	517.6456	11844.77	11252.53	10660.290
150	557.3963	12754.34	12116.63	11478.908
155	598.7451	13700.49	13015.46	12330.437
160	641.7016	14683.42	13949.24	13215.074

Table 5: Estimated Recreational harvest for each LML based on estimated harvest for 2018-19 season and abalone length-weight relationship from commerical catch sampling for the eastern zone collected between 2019-2021.

LML	Est. weight(g)	Harvest(kg)	Harvest 95%(kg)	Harvest 90%(kg)
138	464.6605	11928.30	11331.89	10735.47
140	479.4831	12308.81	11693.37	11077.93
145	517.6456	13288.48	12624.06	11959.63
150	557.3963	14308.92	13593.47	12878.03
155	598.7451	15370.39	14601.87	13833.35
160	641.7016	16473.12	15649.47	14825.81

4.1 Determine relative change in Recreational harvest from initial LML

Table 6: Relative change in estimated Recreational harvest for an increase in LML based on estimated harvest for 2020-21 season and abalone length-weight relationship from commerical catch sampling for the eastern zone collected between 2019-2021.

LML	Est. weight (g)	Harvest (kg)	Harvest Change
138	464.6605	10632.36	1.000000
140	479.4831	10971.53	1.031900
145	517.6456	11844.77	1.114030
150	557.3963	12754.34	1.199577
155	598.7451	13700.49	1.288565
160	641.7016	14683.42	1.381012

Table 7: Relative change in estimated Recreational harvest for an increase in LML based on estimated harvest for 2018-19 season and abalone length-weight relationship from commerical catch sampling for the eastern zone collected between 2019-2021.

LML	Est. weight (g)	Harvest (kg)	Harvest Change
138	464.6605	11928.30	1.121886
140	479.4831	12308.81	1.157674
145	517.6456	13288.48	1.249815

LML	Est. weight (g)	Harvest (kg)	Harvest Change
150	557.3963	14308.92	1.345789
155	598.7451	15370.39	1.445623
160	641.7016	16473.12	1.549338

5 Estimate Recreational harvest based on commercial catch sampling size frequencies

Table 8: Estimated Recreational harvest for each LML based on estimated harvest for 2020-21 season and abalone length-weight relationship and size frequencies from commerical catch sampling for the eastern zone collected between 2019-2021.

LML	Est. Harvest(kg)	Harvest 95%(kg)	Harvest 90%(kg)
138	12731.47	12094.90	11458.33
140	12891.67	12247.09	11602.51
145	13507.29	12831.92	12156.56
150	14238.07	13526.16	12814.26
155	15018.10	14267.20	13516.29
160	15893.95	15099.25	14304.55

Table 9: Estimated Recreational harvest for each LML based on estimated harvest for 2018-19 season and abalone length-weight relationship and size frequencies from commerical catch sampling for the eastern zone collected between 2019-2021.

LML	Est. Harvest(kg)	Harvest 95%(kg)	Harvest 90%(kg)
138	14283.27	13569.10	12854.94
140	14462.99	13739.84	13016.69
145	15153.64	14395.96	13638.27
150	15973.49	15174.82	14376.14
155	16848.60	16006.17	15163.74
160	17831.20	16939.64	16048.08

Table 10: Relative change in estimated Recreational harvest for an increase in LML based on estimated harvest for 2020-21 season and abalone length-weight relationship and size frequencies from commerical catch sampling for the eastern zone collected between 2019-2021.

LML	Harvest(kg)	HarvestChange
138	12731.47	1.000000
140	12891.67	1.012583
145	13507.29	1.060936

LML	Harvest(kg)	HarvestChange
150	14238.07	1.118336
155	15018.10	1.179604
160	15893.95	1.248398

Table 11: Relative change in estimated Recreational harvest for an increase in LML based on estimated harvest for 2018-19 season and abalone length-weight relationship and size frequencies from commercial catch sampling for the eastern zone collected between 2019-2021.

LML	Harvest(kg)	HarvestChange
138	14283.27	1.000000
140	14462.99	1.012583
145	15153.64	1.060936
150	15973.49	1.118336
155	16848.60	1.179604
160	17831.20	1.248398

6 References

Lyle, J.M., Ewing, F., Ewing, G. and Tracey, S.R. (2021). Tasmanian recreational Rock Lobster and Abalone fisheries: 2020-21 fishing season. Institute for Marine and Antarctic Studies Report, 38p.

Lyle, J.M., Ewing, F., Ewing, G. and Tracey, S.R. (2019). Tasmanian recreational Rock Lobster and Abalone fisheries: 2018-19 fishing season. Institute for Marine and Antarctic Studies Report, 36p.

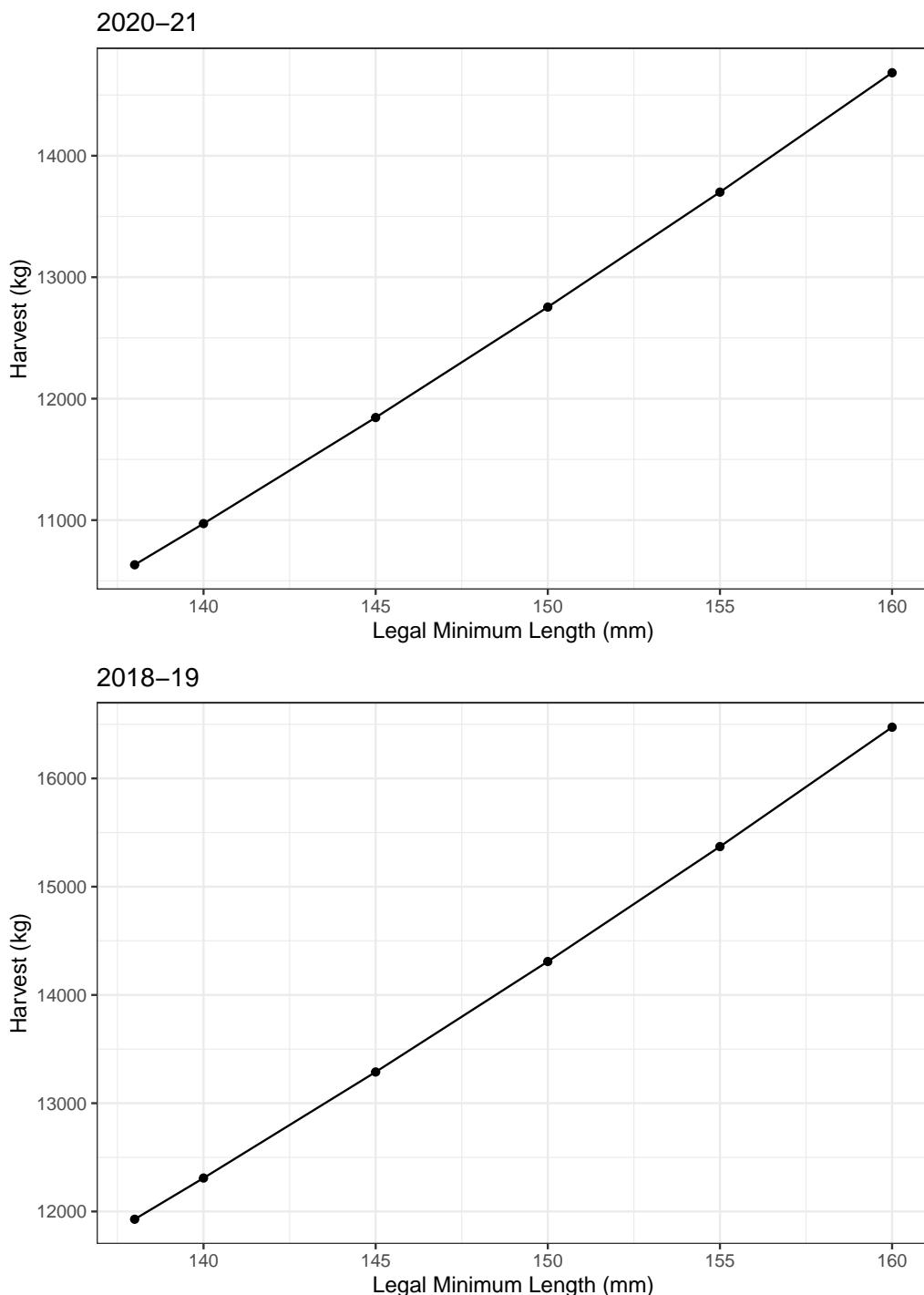


Figure 3: Estimated Recreational harvest in 2020-21 and 2018-19 for each LML based on abalone length-weight relationship from commerical catch sampling for the eastern zone collected between 2019-2021.

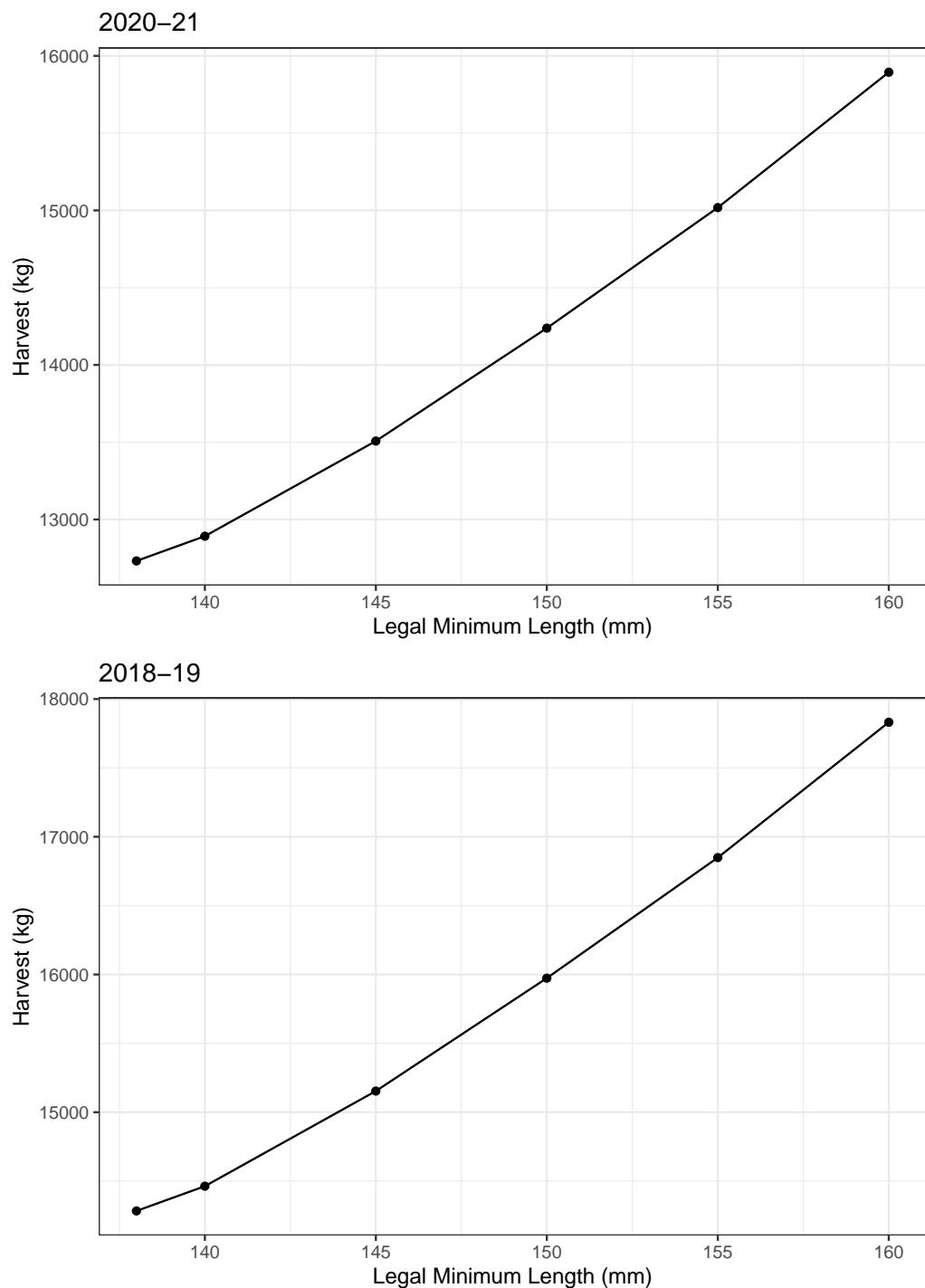


Figure 4: Estimated Recreational harvest in 2020-21 and 2018-19 for each LML based on abalone length-weight relationship and size frequencies from commercial catch sampling for the eastern zone collected between 2019-2021.