A summary of key issues relating to the estimation of poaching trends for west coast rock lobster *Jasus lalandii*.

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Summary

This document provides a summary of the various sources of poaching data available and the method used to produce an overall poaching trend for the west coast rock lobster resource.

KEY WORDS: West Coast rock lobster, *Jasus lalandii*, poaching estimates

Background documents relating to poaching:

1) **Compliance estimates of poaching:** MARAM/IWS/2022/WCRL/BG1 [FISHERIES/2022/JUN/SWG/WCRL/09]
2) **TRAFFIC estimates of illegally exported lobster:** MARAM/IWS/2022/WCRL/BG2 [FISHERIES/2022/JUL/SWG/WCRL/22]
3) **MARAM's "marriage" method to combine the above information:** MARAM/IWS/2022/WCRL/BG3 **and** MARAM/IWS/2022/WCRL/BG4. [FISHERIES/2022/JUN/SWG/WCRL/13 and FISHERIES/2022/JUL/SWG/WCRL/18].
4) **Effect of alternate poaching trends on the assessments.** MARAM/IWS/2022/WCRL/BG5 [FISHERIES/2022/AUG/SWG/WCRL/23].
5) **Effect of alternate poaching trends on future projections of biomass.** MARAM/IWS/2022/WCRL/BG6 [FISHERIES/2022/AUG/SWG/WCRL/25].

Introduction

Over the last few seasons, a method has been developed in the West Coast rock lobster Scientific Working Group (SWG) to combine different sources of data relating to poaching into a single (or several) trajectories for poaching trends in absolute terms (i.e., in tons). Note that these trends are separate for the North (super-areas A1-7) and the South (super-area A8+)(see Figure 4). Assessments of the resource are on a super-area basis.

There are only two sources of information about the magnitude and trend of the illegal take of lobsters in this fishery: analyses by TRAFFIC of international trade (which provide values in tons for exports of illegal catches) and Fisheries Branch: Compliance information (which provides a relative index, and hence trend information for the total amount of illegal catch over time, both that exported and that disposed of ("sold") locally). There are no direct observations available of the size of the illegal catch sold locally.

1) DFFE Fisheries Branch: **Compliance** information (which provides a relative index), and hence trend information for the total amount of illegal catch over time, both that exported and that disposed of ("sold") locally. See MARAM/IWS/2022/WCRL/BG1 for details.
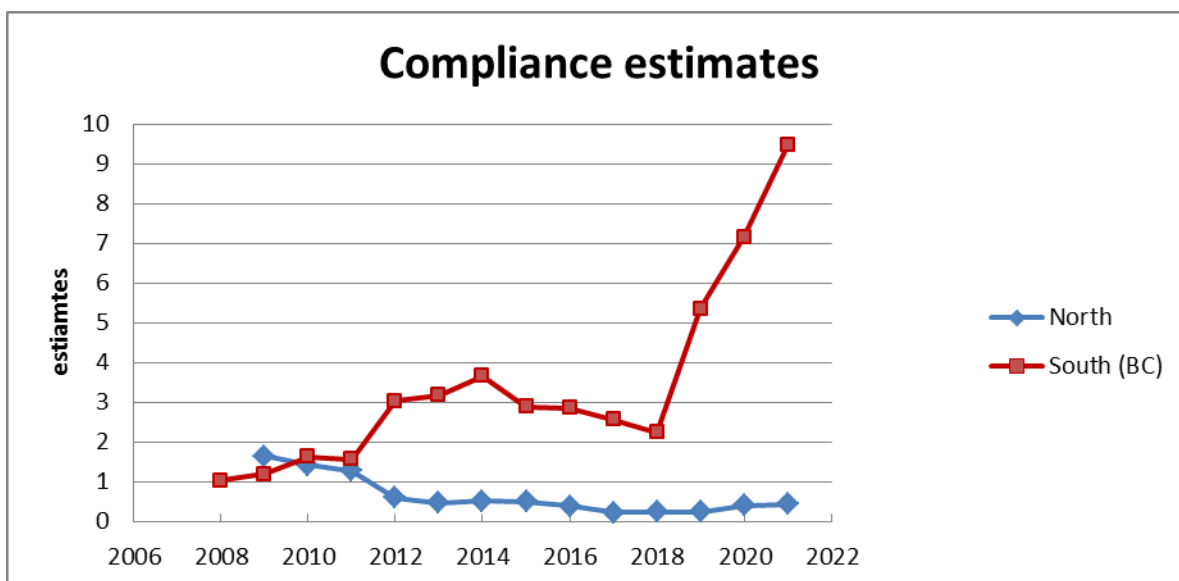
Compliance estimates

Figure 1: Compliance time series for the North and South (3-pt smoothed time series are shown).The units are arbitrary, scaled to commence at 1 in 2008 for the South.

2) Analyses by **TRAFFIC** of international trade in west coast rock lobster, which provide values in tons for exports of illegal catches. See MARAM/IWS/2022/WCRL/BG1 for details.
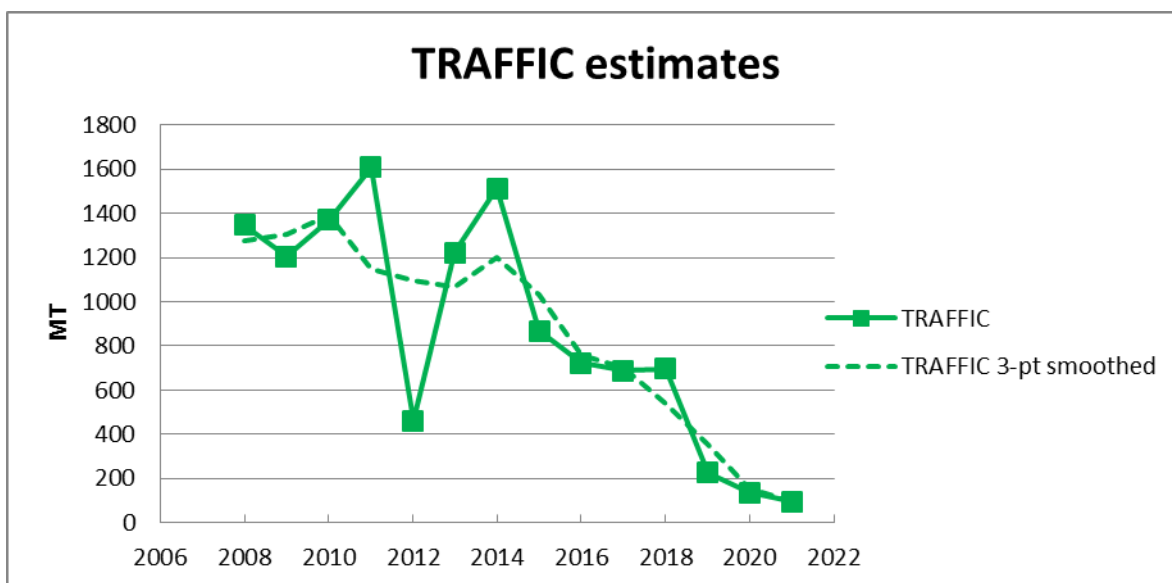
TRAFFIC estimates

Figure 2: Updated TRAFFIC estimates and their 3-pt smoothed time series [Note the 2021 value for both is 95mt].

The broad trends indicated by these two sources are (from TRAFFIC) that illegal exports have declined from about 1600 to 100 tons over about the last 12 years, but (from DFFE Compliance data) that the total of the combined exported and locally sold poached catch has increased about two to three fold over most of that period, and considerably more so over the last two years in the A8+ (Cape Peninsula) region which is now the dominant region for poaching. Clearly then, these two sources of information imply some increase in illegal local sales over the period, but when it comes to attempting to integrate these data at a more quantitative level, it becomes evident that they are

not fully consistent unless one assumes recent illegal local sales of a magnitude that has been so large as to be considered unrealistic.

A "marriage" method (see MARAM/IWS/2022/WCRL/BG3 and MARAM/IWS/2022/WCRL/BG4) was therefore developed which attempts to provide a form of compromise between these two sets of conflicting information. The same method is used as was the case in 2021.

Information available

C_y — Annual compliance-based **index** of poaching for each of the North and South area (for simplicity, this area index is omitted). This trend is assumed to apply to the combination of illegal local sales and exported lobsters [2009-2021].

T_y — TRAFFIC-based estimates of illegally exported lobster [2001-2021]. The TRAFFIC estimates are split 0.30:0.70 between the North and South areas.

L_y — Annual locally sold poached lobster [2009-2021] [These values are to be **estimated**].

P_y — Total annually poached lobster (exported and locally sold estimates added together) for each of the North and South areas [2008-2021].

Assumptions

1) P_y is roughly proportional to C_y, i.e. $P_y = k.C_y$+error.

    Thus $k = \frac{\sum_{2009}^{2021} P_y}{\sum_{2009}^{2021} C_y}$.

    Also $P_y = T_y + L_y$

2) A fixed value of locally sold poached lobsters L_{2021} is used for input. Here we set $L_{2021} =$ 850 mt, 700 mt, 400 mt or 200 mt. These relate to the Total local sales estimate, and these are again split 0.30:0.70 between the North and South areas.

Furthermore

3) L_y should not be negative.
4) P_y should not change too much from year to year.

Estimable parameters: $L_{2009}, L_{2010} \dots L_{2020}$ (12 estimable parameters). [L_{2021} is fixed]

The values of the estimable parameters are obtained by minimising the following function:

$SS=SS1 + SS2 + SS3$

$$SS = w1 * \sum_{2009}^{2021} \left(P_y - kC_y\right)^2 + w2 * \sum_{2009\prime}^{2021\prime} L_y{}^2 + w3 * \sum_{2009}^{2021} [P_y - P_{y-1}]^2$$

where $\sum_{2009\prime}^{2021\prime} L_y{}^2$ is summed only for those years for which L_y is negative.

The weights w1, w2 and w3 can be varied to see what form of P_y trajectories result.

Note:

By increasing w2, the Local Sales trajectory is pushed higher, so that negative values become of increasingly smaller magnitude.

By increasing w3, the overall poaching time series is "smoothed" over time. Last season (2021) it was agreed that for results should be presented for the weights of **w1=1, w2=5, w3=0.5** as these seemed to reflect reasonable compromise weightings.

In broad terms, the outcome from this "marriage" method is a downward trend over most of the last 12 years, but with an uptick at the end of this period, where the size of that uptick depends on the value input for illegal local sales at present (see Figure 3).
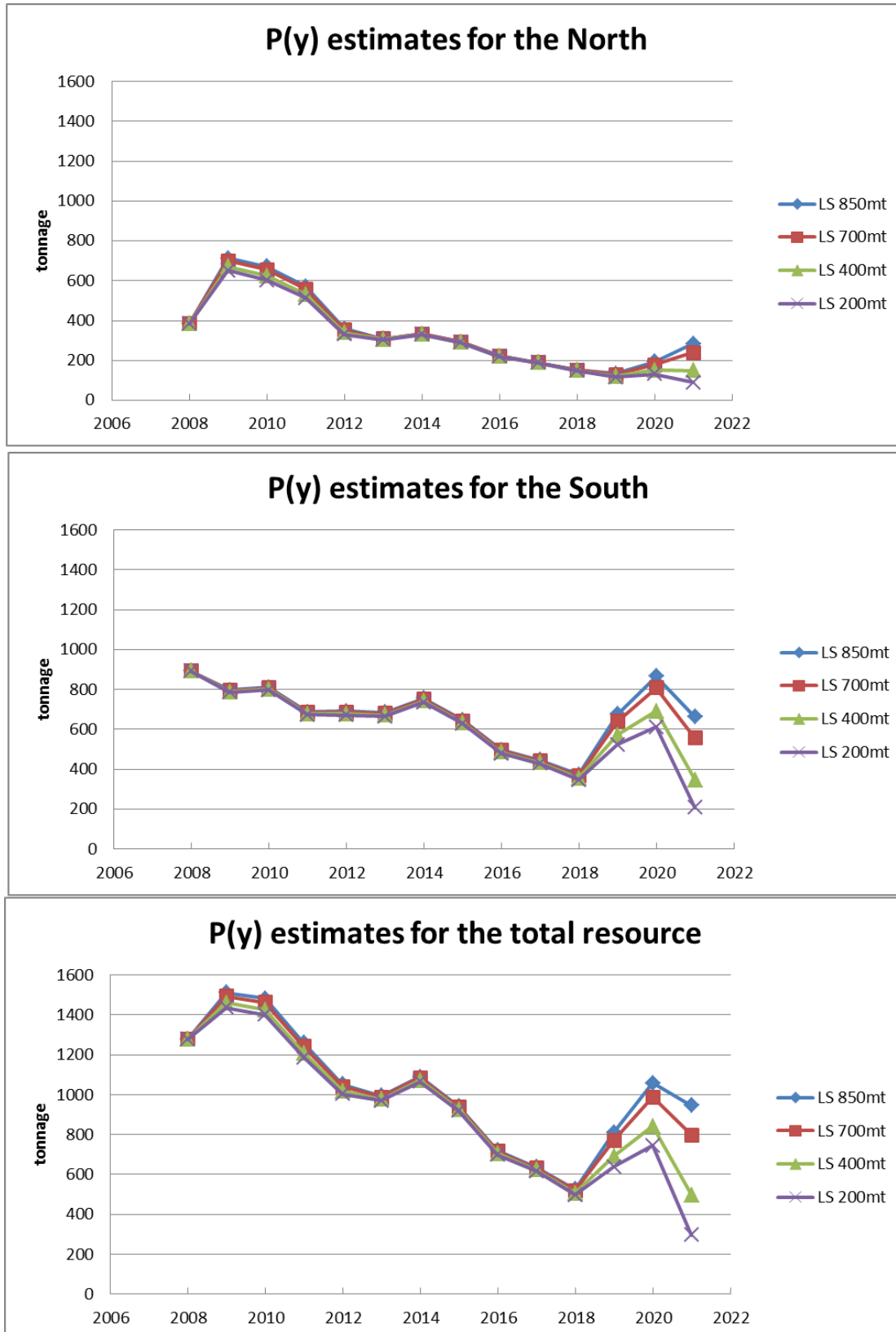
Figure 3: Poaching P(y) estimates for the North, South and the total resource (bottom plot). Results are for 850mt, 700mt, 400mt or 200mt for local sales in 2021 (LS(2021)).

Impact of alternate poaching trends on stock assessments

The West Coast rock lobster resource is assessed at a super-area level. Currently there are five super-areas (A1+2, A3+4, A5+6, A7 and A8+). See Figure 4 below showing these super-areas on a map.
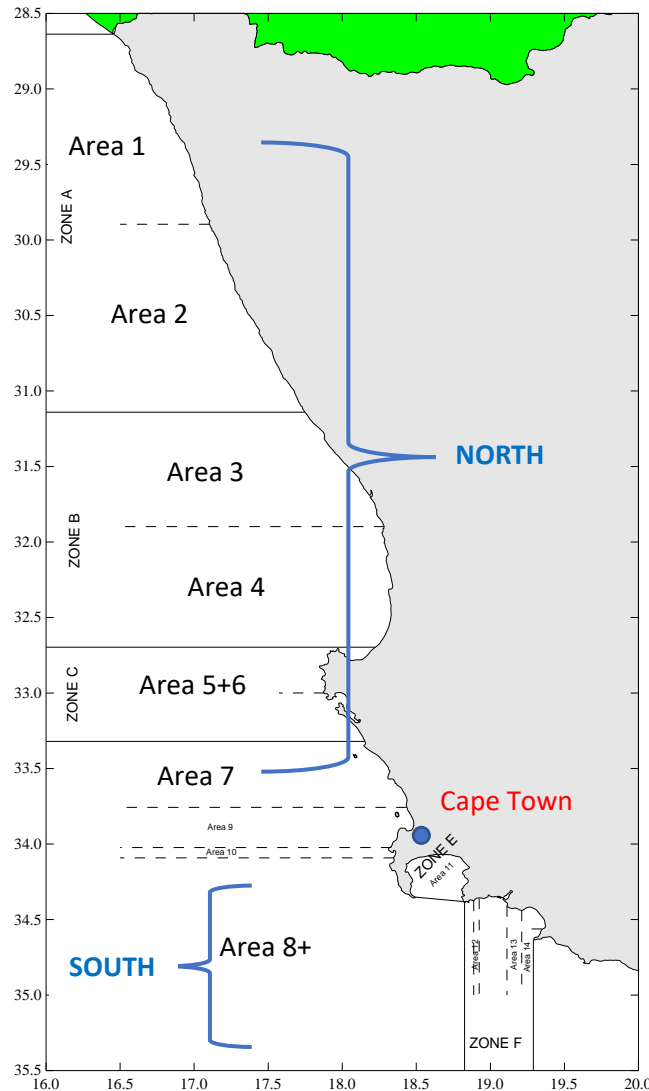

Figure 4: Map showing the five super-areas used in assessing the west coast rock lobster resource.

The updated assessments (see MARAM/IWS/2022/WCRL/BG5) show very little sensitivity to the underlying poaching trends. Figure 5 compares the estimates of male biomass above minimum legal size (B75m) relative to 2006 between the two extreme cases of alternate poaching scenarios (LS(2021)=850mt vs 200mt.

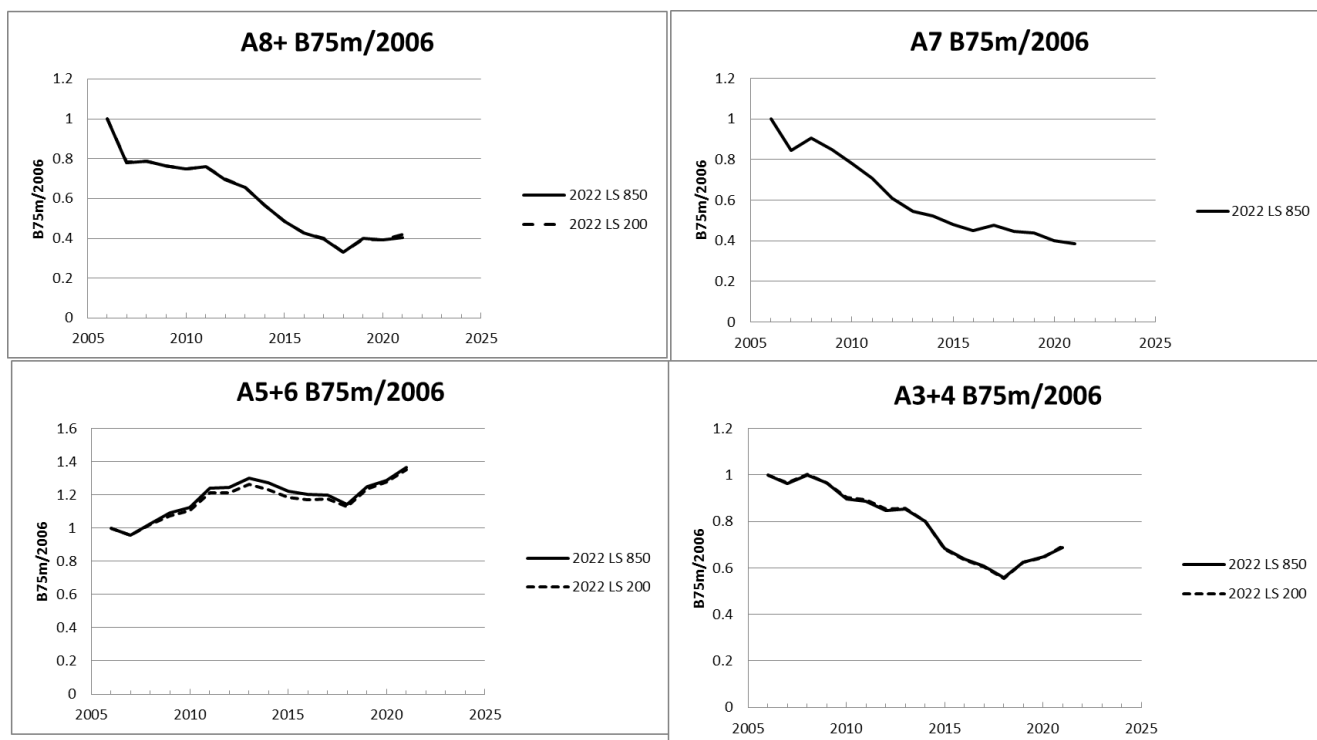It is also important to note that current B75m is estimated to be only some 1.4% of the pristine level.

Figure 5: Updated 2022 assessment estimated biomass trends (B75m relative to 2006).

Impact of alternate poaching trends on future projections

When considering appropriate TACs for the resource, future projections are heavily impacted by the assumption one makes regarding the future poaching trends. Currently future (2022+) poaching is assumed to continue unchanged into the future at the 2021 level. Although the resource is assessed for each of the five super-areas, biomass across these super-areas are combined when considering the impacts of future TACs on the resource. The key statistic that has been used when comparing the impact of future TACs on the resource is the B(25/21) statistic which relates to the combined or total B75m in 2025 relative to that in 2021. A range of future constant catch scenarios were examined and results compared for each CC strategy over the four poaching scenarios. Figure 6 below, taken from MARAM/IWS/2022/WCRL/BG6, shows a summary of these results which were used in recommending the 2022/23 TAC for the resource.
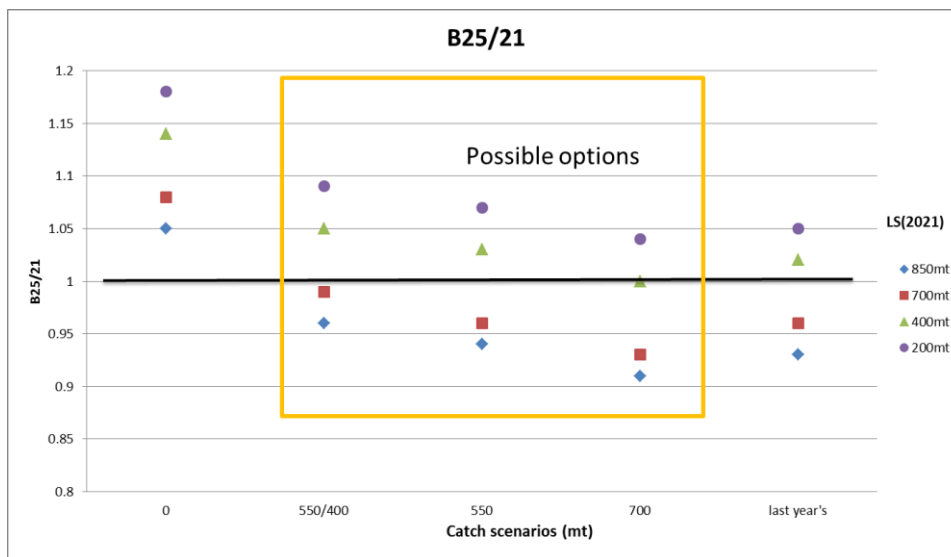

Figure 6: **B25/21** statistics for the total resource under different future CC levels. Results are shown for four levels of recent 2021 local illegal sales (200, 400, 700 and 850mt) and these values projected into the future.

CAF meeting December 2021

In December 2021 there was a CAF (Consultative Advisory Forum) meeting to review, amongst other topics, the method of estimating poaching trends for west coast rock lobster. A summary Recommendation taken from the CAF report (Dec 2021) relating to poaching estimates is as follows (see also the Appendix below):

> A more supported poaching estimate should be agreed upon by the SWG, SSF (small scale fishers) and industry observers and used in the TAC determination of the 2021/2022 season, if possible, but certainly by the 2022/23 fishing season. Addressing differing poaching estimates to obtain better agreement could improve estimates and confidence in fishery model inputs and outputs. There is an urgent need for stronger co-operation between the Department (research and compliance), TRAFFIC, industry, and small-scale fishers to advance this work and CAF recommends the DFFE urgently sets up a Task Team/Subgroup with Compliance, SWG and observers to re-consider poaching estimates. A clear timeline is essential as these ongoing discussions on poaching estimates still lack consensus. The DFFE SWG, Compliance, SSF and industry observers to establish a Task Team to work cooperatively to try to arrive at estimates, or bounds, of the extent of illegal fishing that are considered by all to be as close to the realities as possible. This could result in improved

estimates and should lead to improved confidence in model inputs and thereby outputs and should be done in time for use in determination of TAC recommendations for the 2022/23 fishing season. The rationale for this recommendation is that there has been ongoing discussions and differences on poaching estimates for years and no consensus has been reached. The inclusion of suitable impartial experts in the Task Team may facilitate achieving consensus.

A response from MARAM: FISHERIES/2022/APR/SWG/WCRL/01.

It is difficult to suggest what more can be done without further data. As long as there is agreement that:
i) *TRAFFIC data provide reliable estimates of illegal exports in absolute terms (which these data suggest to have been generally trending downwards over the last decade), and*
ii) *the compliance data provide an index of the poaching, and has generally been higher than its level in +-2010 over the last decade,*

then it necessarily follows that local illegal sales must have been increasing over that period and currently be large.

Those contesting current inferences need to table evidence to support some alternative.

Key Questions for the IWS Panel

1) How might the algorithm set out above to combine the conflicting data sources available to improve poaching estimates be improved?

2) How might any information becoming available about local sales of poached lobster be incorporated in these calculations of the total amount poached.

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Appendix: Relevant Exerts from the CAF report relating to west coast rock lobster poaching.

Review of data on the poaching and local sales estimates used in the TAC model

<u>Brief description of methodology (provided by DFFE)</u>

Illegal fishing is recognised as a serious problem in the WCRL fishery and it is essential to take this into account when formulating TAC recommendations. While it may seem surprising to some, the magnitude of the actual amount being poached (extracted illegally) may have little impact on the assessment of resource status. This is most easily understood by considering the situation where the magnitude of illegal fishing has been unchanged over the recent past and will remain so in the immediate future. TAC recommendations will then remain unchanged whatever that magnitude is. This is because the bigger it is, the larger the resource and its productivity must be and that larger productivity will simply be offset by the bigger unchanged future illegal take, so that the recommended legal take (TAC) remains unchanged. This is the basic reason why the assessments of the <u>current status</u> of the lobster resource relative to the 2006 benchmark (now 70% thereof) are hardly impacted by different estimates of the magnitudes of past poaching. But this general result no longer holds if the quantity poached each year has been changing over time, particularly as regards projections and hence TAC recommendations. For this reason, attempts have and continue to be made to estimate the magnitude of lobster poaching and its trends, despite the very limited data available. The assumption standardly made for projections is that poaching will continue at its current level into the future and those projections and therefore estimates of what (legal) TAC will be sustainable depend on the estimated level, especially of recent poaching.

There are only two sources of information about the magnitude and trend of the illegal take of lobsters in this fishery: analyses by TRAFFIC of international trade (which provide values in tons for exports of illegal catches) and Fisheries Branch: Compliance information (which provides a relative index, and hence trend information for the total amount of illegal catch over time, both that exported and that disposed of ("sold") locally. There are no direct observations available of the size of the illegal catch sold locally. The broad trends indicated by these two sources are (from TRAFFIC) that illegal exports have declined from about 1800 to 400 tons over about the last 12 years, but (from DFFE Compliance data) that the total of the combined exported and locally sold poached catch has increased about two to three times over most of that period, and considerably more so over the last two years in the A8+ (Cape Peninsula) region which is now the dominant region for poaching. Clearly then, these two sources of information imply some increase in illegal local sales over the period, but when it comes to attempting to integrate these data at a more quantitative level, it becomes evident that they are not fully consistent unless one assumes recent illegal local sales of a magnitude have been so large as to be considered unrealistic. A "marriage" method was therefore developed which attempts a form of compromise between these two sets of information. In broad terms, the outcome from this is a downward trend over most of the last 12 years, but with an uptick at the end of this period, where the size of that uptick depends on the value input for illegal local sales at present. The TAC recommendations finally developed were based on values for these sales in the range of 400 and 700 tons (which happened to be the same as the conclusion reached by the SWG the previous year). Lower and higher values were also considered for various reasons, but were ultimately rejected by the SWG. The former led to an inconsistency between the information provided by the TRAFFIC and Compliance trends that was judged to be too large. The latter were seen to be unrealistic, given comments made by industry stakeholders. A summary of the key technical aspects is provided in Appendix 4.2 of this report.

Summary representations and recommendations from stakeholders on the poaching and sales estimates

RECOMMENDATION	ORGANIZATION
Implement a proper and effective compliance mechanism for the recreational sector. Post Offices must supply the total number of WCRL permits issued every year.	SASSFC– The Collective
Engagement with DFFE and TRAFFIC on reliability of local confiscations/poaching estimates and TRAFFIC illegal exports estimate	USSFA+KKRH
It is clear from this slide (in WCRLA presentation) that the poaching figures are important for the forecasts. The plausibility of poaching data has been questioned: With reliance on observation or anecdotal evidence vs actual data. The association has objected to the method used to determine the poaching figure	WCRLA

Integrated considerations and recommendations by CAF members

CAF acknowledges the valuable presentations made by the DFFE and the observers on the issue of poaching of the WCRL resource. The CAF reinforces the need for a more integrated approach by the DFFE to combat fish crime under the auspices of Phakisa Initiative 5, to collaborate with other law enforcement authorities, focused on preventing illegal harvesting and poaching of high value species such as WCRL and other marine resources. It has been reiterated in the CAF discussion that enforcement efforts from Fisheries Monitoring Compliance and Surveillance (MCS) must not only work with other enforcement agencies but also draw in the fisher communities and utilise a co-management approach as a remedial action to curb the scourge of poaching of our valuable fish resources. Recommendations were made to the Department to investigate supplementary livelihoods. This recommendation warrants in depth discussion with multiple stakeholders. In essence, this calls for urgent action from the DFFE and its Monitoring, Compliance and Surveillance chief directorate to co-develop a poaching reduction strategy in collaboration and through active engagement with various role players and stakeholders in the fishing industry. The result should be a sustainable WCRL resource for the beneficiation for current and future generations

CAF has noted the concern around the uncertainties in the current poaching estimates, the history of overfishing and the limited research available on poaching estimates. Also, the capacity constraints in both research and compliance were highlighted by presentations as areas that needs to be addressed urgently. After intensive deliberations, considering all the information provided from all parties, CAF recommends an urgent intervention for stronger co-operation from the DFFE Fisheries Research, its Monitoring, Compliance and Surveillance components together with TRAFFIC, industry role players and SSF, to review, and refine as necessary poaching estimates used in the current model.

CAF has the following recommendations on Poaching:

- DFFE to urgently co-develop and implement a WCRL poaching reduction strategy by 2022/23, with clear targets to be achieved by 2025 (for indications of resource recovery). The strategy will require an integrated, two-pronged enforcement approach. The one aspect would involve tackling the organised crime component of illegal fishing and the other to focus on addressing the drivers of poaching and community involvement in crime prevention, enforcement, awareness. The strategy should include:

- An improved compliance and policing effort required during the open and closed months of the fishing season. o Inter-agency co-operation with links to the Operation Phakisa Integrated Enforcement Task Team o Application of improved technology to assist with traceability; o Effective co-management with support from the sector in tackling illegal fishing; o Implementation of a system whereby marketers need to be approved by the DFFE, thereby helping to close poaching loopholes.

- The DFFE SWG, Compliance, SSF and industry observers to establish a Task Team to work cooperatively to try to arrive at estimates, or bounds, of the extent of illegal fishing that are considered by all to be as close to the realities as possible. This could result in improved estimates and should lead to improved confidence in model inputs and thereby outputs and should be done in time for use in determination of TAC recommendations for the 2022/23 fishing season. The rationale for this recommendation is that there has been ongoing discussions and differences on poaching estimates for years and no consensus has been reached. The inclusion of suitable impartial experts in the Task Team may facilitate achieving consensus.

CAF document APPENDIX 4: ADDITIONAL TECHNICAL INFORMATION RELEVANT TO CURRENT METHODS AND APPROACHES BY DFFE IN THE WCRL SECTOR (section relating to poaching)

Additional technical detail on Poaching estimates provided by DFFE

In the interests of simplicity, the summary has been expressed in terms of two time series of data – poaching trend information from TRAFFIC and from Compliance. However, those two series are themselves not "raw" data/observations, but follow from considerable and sometimes complex pre-analysis of those original data. The information below briefly summarises those pre-analyses. • TRAFFIC estimates of poaching are based on differences between reports by export countries of their legal exports, and those from import countries of their total imports. However, the product codes used by exporters in their reports do not refer to west coast rock lobster alone, but cover a combination of species. Detailed discussions with TRAFFIC have occurred over many years in the SWG as to how best to "subtract out" the contribution of, e.g., south coast rock lobster, with this approach improved over time.

• The resultant estimates of the amount of lobster poached annually are confounded by delays (typically many months) between the dates of harvesting and of import to a foreign country. Approaches have been developed to smooth the data, and to adjust for clear retrospective patterns indicating a negative bias in the value calculated for the most recent year.

• The Compliance data are used to provide an index: "Confiscations per unit of policing effort", which is taken to be proportional to the amount of lobster poached each year.

• Calculations are confounded because for most of the period considered, confiscations are not linked to the particular policing effort type (e.g., vehicle inspection, beach patrol) that gave rise to that confiscation. This policing type needs to be taken into account, as different effort types have different confiscation efficiencies, so that the analysis needs to adjust for those as the proportions of the different types change from year to year.

• Analysis of the data as a whole to take account of both those with and without this linkage has been achieved by a method developed in conjunction with the international review panel on the last two occasions when it reviewed the west coast rock lobster assessment.

• These Compliance analyses distinguish the A8+ regions and those further north, as the trends over time for the two differ (this complication was not mentioned in the summary above for simplicity); however, it is the A8+ region which now dominates the overall poaching removals.

• The method used to "marry" the two sources of information starts from the assumptions that the TRAFFIC series provides values of the annual illegal takes exported in mt, and the Compliance series is linearly proportional to the overall annual illegal take (both as exported and as sold locally). However, a model fitting process is used which allows for errors in this last assumption, and estimates the annual illegal takes sold locally in mt. It does this by introducing further weighted constraints that seek to prevent any estimates of that illegal take being negative (especially so), and an overall poaching trend over time which is reasonably smooth.

• This "marriage" procedure would still result in very high estimates of the current illegal local sales, so that the model is run for different fixed inputs for that quantity, which are judged to bound within a realistic range.

• This "marriage" method was introduced because the two most recent very high indices of total poaching provided by the Compliance data became especially difficult to reconcile with the TRAFFIC trends, and in the interests of having a clear, objectively based and replicable procedure, despite still being somewhat sensitive to weighting parameter value choices.