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Estimation of variability in Purse Seine catch weights

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This paper (i) presents a report on the options for the use of Hook Type Crane Scales for the standardization of transshipment monitoring in the WCPO Purse Seine fishery and (ii) recommends further research in this field to improve the accuracy in catch weight data during the catching operation.

Members are invited to note the report presented and to provide feedback and possibly their support on the recommended further research.

Introduction

Fishery dependant data, in particular catch data, is essential for managing sustainable fisheries. Catch data are multi use, serving commercial, compliance and scientific purposes. Generally, only when the catch reaches the final point of processing is its weight accurately known. Visual observations are used to estimate catch weight during catching, storing and transshipping operations. Obtaining greater accuracy of catch weight before processing is seen as providing multiple benefits.

For scientific purposes, catch data are a key parameter in the stock assessment of species. Catch data informing stock assessment work in the region comes from logsheets, observer, port sampling, transshipment, unloading and cannery operations. Cannery reported catch data can be considered as the most accurate as the catch is sorted by species and size-class before being weighed with electronic scales. Catch data reported by vessels at the other end of the operation, at the set level on logsheets, are visual estimates of the fullness of either the brails used to haul the fish out of the net and/or of the wells where the fish are stored. Ideally, cannery data can be used to adjust logsheet data estimates, however cannery data available to SPC can be incomplete and the time from when the fish are caught until they are unloaded for processing is generally a few months or longer.

Congruent with the major progress made with the use of electronic logsheets for providing near real time operational and catch data, the use of hook type crane scales for calibrating the weights of brails used during capture and/or transshipment provides a further tool for validating a vessel's catch weight data. However uncertainty in the field accuracy of this equipment has not been fully tested and requires further investigation.

Cranes scales during transshipment

Improving the accuracy of catch data through the standard use of electronic tools was first investigated in 2019 during a pilot study in Majuro, Marshall Islands. The findings and recommendations are presented in Annex 1.

This pilot study tested four models of crane scales and recommended one that was most suitable to monitor transshipment operations with.

Recommendation 1:

To completely assert the usefulness of crane scales during transshipment, it is proposed that a more in depth comparative study be designed and implemented. Specifically, the complete unloading (to a cannery) operation of a purse seine trip would need to be monitored using the recommended crane scale to compare against the trip's total retained catch weight reported by the vessel, the observer and the cannery. This would involve a team operating during the same hours as the unloading of a vessel and require robust planning to ensure the work can be conducted efficiently considering that unloading operations are complex. This would also involve designing a process and materials for calibrating the crane scale, something which was not achievable in the previous study. Undertaking this study in 2021 would be timely in that it would be concurrent with ongoing research aimed at establishing regional standardised transshipment monitoring procedures. Recording the weight of each net unloaded in an electronic manner would also need to be considered to avoid multiple data entries.

Crane scales to improve brail capacity estimation

The pilot study also tested a highly robust crane scale which was considered suitable for testing during at sea brailing operations.

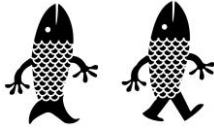
Recommendation 2:

Design a research study to investigate the use of crane scale technology for improving the estimation of the capacity of different types of brails used in the tropical tuna purse seine fishery in the WCPO. Specifically, the study should investigate how crane scale technology can be used for calibrating the capacity of a brail at different fullness levels, noting that this calibration exercise is only required for a small percentage of sets during selected trips to avoid disruption to the fishing operation. Improving the accuracy in estimating brail capacity has direct benefits to a vessel operator and also allows improvements to human observer and electronic monitoring methods of estimating catch weight.

Other considerations

While the proposed research above has a science focus, the use of crane scales for greater catch weight accuracy also the potential to reinforce Monitoring Control and Surveillance (MCS) practices, including the ability to determine under and/or mis-reporting at the time of transshipment. Standardising the use of crane scales in transshipment operations has the ability to strengthen Port State Measures and the ability for some member states to work on cost recovery mechanisms based on a transshipment fee per volume instead of flat fees as currently done.

Annex 1: *An investigation of options for the use of Hook Type Crane Scales for the standardization of transshipment monitoring in the WCPO Purse Seine fishery.* Francisco Blaha, 2019.



An investigation of options for the use of Hook Type Crane Scales for the standardization of transshipment monitoring in the WCPO Purse Seine fishery



Best performing scale in action

November 2019

Client:



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1 Background

Monitoring activities in port (both for transshipment and unloading) is increasingly becoming a key element in port operations and a key base for CDS development. This practice is designed to gain to effectively monitor the volumes being transhipped and to provide general oversight of operations in the context of national port state measures.

Monitoring can be carried out either by designated boarding officers or by fisheries observers contracted as free agents. Monitoring personnel board vessels in order to:

1. Estimate catch volume and composition and compare it with what is reported
2. Record the presence of species of interest
3. Provide the data and information collected to the compliance unit

For this type of work, when the monitors are contracted qualified observers, they report to the boarding officers and not to the Observers Unit.

The basis of their work is in “observing” the whole transshipment and provide estimations of the weight in the “slings” passing from the FV to the carrier. Their presence on-board also acts as a deterrent for vessels to conduct illegal activities.

The weights recorded are “estimated weights” based on the estimations of the weight in the “slings” passing from the FV to the carrier, furthermore these are usually classified as mixed in terms of species, even if there is pre-sorting below deck by species.

Since a Purse Seiner catches and carries about 800 to 1700 metric tons depending its size and age, the transshipment is a slow process taking up to a week and involving putting the frozen catch in nets (slings) and hoisting it from the catching vessel into the carrier with a crane.

In general, this is a highly inaccurate operation, with the vessel mate or deck boss providing estimates of weight which is recorded with paper forms and once completed, passed to the boarding officers who then have to take them on face value and enter the estimated data accordingly. This is rather an unproductive and inefficient way to operate.

However, new technology advances are such that there is an opportunity to substantively improve this monitoring process and record accurate weight data for the entire transshipment, based on the use of hanging crane type scales (called dynamometers) with wireless remote weight display attached to the hooks of the cranes used during the operation. This provides an opportunity to record accurate transshipment weight data and eliminate the challenges and issues relating to estimates.

It is well known to the region that one of the key IUU issues relates to underreporting and misreporting of catches and transshipping is the last opportunity to measure the level of catch reporting before the fish are transported to the processing destination.

Using the resources available to FFA under the PEUMP programme activity 4.3 which aims to undertake *Trials of new technology to assist national and regional Monitoring, Control and Surveillance (MCS) efforts*, an activity was developed to undertake a trial and test the use of hook type crane scales. Four test models were selected for an initial trial to be undertaken in Majuro, RMI.

The aim was to assess the applicability of utilising crane scales during the transshipment process, assess the best data acquisition methodologies and compare the four selected test models. It was proposed that if the initial trial report concluded the trial was successful, a second phase of the project in support of adoption in other ports with associated standardisation could be considered.

2 Tasks

The agreed tasks in the Terms of Reference for this study were:

- The consultant will lead and coordinate a technical assessment of the use of hook type crane scales as a means of obtaining improved data on specific weights of per net weights of fish during purse seine transhipments.
- This will include three activity areas as follows:
 1. Coordinate the purchase of up to four different models of hook type electronic crane scales.
 2. Lead the team of MIMRA transhipment monitoring staff in conducting an assessment of the various models in terms of ease of use, durability, accuracy and cost effectiveness.
 3. Prepare a comprehensive report of the findings, including audio-visual support material based on the on-board activities would be presented covering, *inter alia*, the following elements:
 - a. The methodology and timeline applied to completing the pilot;
 - b. Challenges encountered in completing the required pilot;
 - c. Recommendations as to the most suitable scale model(s) which could be used in the implementation of a possible wider roll out of the use of hook type electronic crane scales in other transhipment ports.
 - d. In a wider SPC/FFA consultative process, provide suggestions as to the appropriate mean of electronic data collection including development of forms and IMS integration protocols
 - e. Recommendations as to an appropriate strategy for the implementation of a possible wider roll out of the use of hook type electronic crane scales in other transhipment ports.
 - f. Give consideration as to a plan for training and the resources required for roll out
 - g. Provide a risk assessment including consideration of potential problems that may arise and suggestions for resolving those problems.
 - h. At a time agreed with FFA, conduct a workshop presenting the results of the work.

3 Results

3.1 Selection and Procurement

The selection process took place from August to October 2019 where the consultant selected 5 models and proposed them to FFA PEUMP staff for procurement. The selection was undertaken based on internet search, contact with manufacturers, discussions with Malo Hosken SPC's EM/ER specialist and prior experiences of the consultant with remote indicator scales. One of the selected providers did not respond so ultimately 4 models were purchased with the intention being to maximise the scope of the trial by comparing the 3 different types of scales:



It was also agreed to evaluate those models with a certain level of motion compensation vs those without and also to allow for a wide price range.

The following selection was agreed :

Brand	Model	capacity	recommended accessories	Motion comp	supplier link	Price (est)	delivery to RMI (est USD)
Hiab	XW 50 SHV	5t	ComBox WiFi / Display kit with Android	y (software based)	https://webshop.hiab.com/en/loader-		
Sigma Hellas	Sigma EBW series wireless	5t	it comes with wireles indicator	n	https://www.sigmahellas.gr/marine/car	1100	300
Intermercato	Intelweigh Compact70BS	up to 7	Shackels and hook / Connects to android	y (software based)	https://www.intermercato.com/en/prod	9 950,00 €	Not quoted
Eilon Engineering	Ron 2501 - H-05	5	to be ordered with available with data loggers, serial/USB outputs or wireless communication with PCs	n	https://www.eilon-engineering.com/code/2501/2501h.html	3,148.00 USD	256
Vetek	Wireless load shackle IP67 5T	5	it comes with wireless indicator	n	https://www.vetek.com/wireless-load-	750	300

The procurement process was managed by FFA and resulted in the acquisition of 4 units, as repeated approaches to the Hiab model sellers were to no avail.

The four scales arrived to Majuro in time to conduct the trial. However, for some unknown reason, the Vetek model provided the same type of load cell as the Hellas model instead of a load shackle, so was agreed to test only 3 of the acquisitions with the 4th scale to be used being a very cheap hook scale previously acquired by MIMRA for use in an earlier preliminary trial internal trial.

While unfortunate, the lack of a load shackle wasn't a major issue, as the consultant had previously worked with a cheap load shackle type that was procured for Kiribati, and it had been found that it performed very similarly to the cheap hooks scale.

3.2 Assessment trial of the models

The trial took place from the 24 November till the 1st December 2019 in Majuro with 5 consecutive days on board the FV Marshalls 201 plus two days on land preparations to acquaint with the scale's operational manuals and to undertake debriefings.

All trails were performed by a team that involved Feral Lasi, FFA's PEUMP MCS Adviser; Malo Hosken SPC's EM /ER Specialist; MIMRA's officers Beau Bigler and Melvin Silk and the consultant. The team also included Jenrok Joel, the MIMRA transhipment monitor assigned to the vessels.

A comparative demerit points-based matrix was designed to evaluate the desirable characteristics of the scales. The matrix is discussed in detail in section 3.3.2.

3.3 Results

The results are reported in the order outlined in the ToR

3.3.1 Timeline and methodology

The timeline is presented in section 3.2

The methodology of the assessment was discussed with Malo Hosken prior to the trials. It involved boarding the vessel Marshalls 201 with the team, fixing the scales via a shackle to the winch of the carrier and letting them operate “as usual”.

Based on boarding craft availability for the team we operated to approximate 10 am to 4.30 pm. Once we had 40 readings, we changed scales and try the next one.

The transshipment monitor deployed to the vessel was part of the team and was assigned two activities:

- 1) Perform the standard visual estimation for at least 40 slings passed to the carrier as to compare with our values from the scales. During the use of the scales, take the data from a separate area of the vessel, as to be able use his observations and non biased “control” for comparisons. After 40 slings the monitor joined the team and get acquainted to the scale reader and our reading methodology
- 2) Once we left the boat, the monitor continued using the scale up to 10 pm at night to evaluate battery performance and robustness and also to record the accurate value records.

Upon return to MIMRA HQ we discussed the merits of the scales tested and added agreed values to the matrix and prepared for the next day. Basic statistical analysis of the values obtained by the team with the scales vs the value estimated by the monitor estimates was undertaken once the on-board trials finished.

3.3.2 Opportunities and challenges encountered

As with any on board operation in fisheries, there were a number of unexpected challenges which were resolved through the use of a strong support network.

3.3.2.1 Increased accuracy in terms of transshipped weights

Basic statistics analysis, on values obtained by the team vs the value estimated by the monitor shows that the accuracy of weights is significantly increased by the use of scales, hence their use is recommended.

Interestingly in every single case monitor (and sometimes winchman) estimates were higher than the scale weight, hence overreporting (consistently above 10% in weight) is much more prevalent than underreporting.

The analysis below compares and summarises the monitors estimates and the scales estimate for 120 weight determinations.

Sample	Estimates	Scale	Estimated	Scale	Estimated	Scale
1	900	743	1500	1301	2000	1820
2	800	653	700	603	1900	1690
3	1800	1629	1300	1011	900	785
4	900	785	800	706	2000	1752
5	700	661	800	696	1000	906
6	700	567	900	806	1000	910
7	1000	821	800	720	1000	930
8	800	714	500	394	900	756
9	1100	982	1000	836	1100	948
10	700	608	700	616	1000	898
11	900	813	600	482	1800	1690
12	1600	1433	1400	1285	900	778
13	800	736	600	491	950	818
14	600	528	800	699	1800	1628
15	950	810	500	329	1200	1030
16	1000	906	700	617	750	668
17	700	620	700	636	900	838
18	400	299	700	630	600	573
19	900	793	800	679	800	657
20	700	640	700	563	1700	1554
21	700	582	850	720	500	382
22	900	758	700	630	1500	1365
23	400	353	800	660	900	755
24	900	761	800	682	700	519
25	1000	862	800	749	1000	801
26	900	752	700	586	1100	983
27	850	738	1000	846	1500	1301
28	850	718	700	556	800	769
29	550	413	1800	1660	700	596
30	900	820	700	602	1100	985
31	700	527	1800	1667	1400	1237
32	800	675	750	620	950	834
33	1000	862	1200	1001	900	772
34	1700	1544	1500	1370	1300	1168
35	700	662	900	747	1800	1632
36	1000	826	1000	876	1000	902
37	800	750	1000	884	1500	1364
38	1100	960	1000	869	750	639
39	1700	1527	1100	937	1400	1307
40	800	655	1200	1068	900	821
AVG	905.00	787.15	920.00	795.75	1147.50	1019.03
STDEV	312.52	291.72	320.62	303.89	406.67	380.73
AVEDEV	204.5	189.04	246.00	224.04	336.75	313.58

3.3.2.2 Full support of masters and crew

Until the “weight in” is recorded (mostly at the cannery - yet increasingly at containerisation at some wharfs) all reported volumes are based on educated estimates during fishing. And while they are surprisingly good, they are not independently evaluated and agreed figures, and there is often a delay in between the fish leaving the vessels and being weighted.

Catch figures translate to money in fisheries, hence it is no surprise that transshipment volumes are a source of conflict in between the masters of the PS and the Carriers since those “agreed” volumes have ramifications on issues around liability, insurance, payments, etc.

Furthermore, volumes are fundamental for vessel management as masters and chief engineers get paid on only catch percentages, while and crew get a salary based on rank and in most cases a

variable % of catch sales based on rank. Vessel managers and agents also have an interest to receive accurate data since it determines early figures around trip profitability, insurance values, etc.

The fact that the transhipped volumes are evaluated “independently” by the regulator is totally welcome, since it takes the perceived bias around interested parties. Provided weight results are transparently shared, vessel operators are generally happy to have the monitors on board even if the transshipment takes bit more time since each lifted sling need to be stabilised for an estimated 5 to 10 seconds for weight reading.

Adopting the use of crane scales can be viewed as a great opportunity for a potentially cost recovered service offered to the fleet at port. However, it is also a significant responsibility that will require changes to the whole monitoring practice from an operational and management perspective. This is further discussed in section 3.3.5

3.3.2.3 Tare of scale

The tare of the scale was a relatively minor challenge, all readers had a tare function to zero the weight once the tare weight was defined.

Most vessels have a transshipment “sling” made of two pieces of chain (around 2 to 2.5 m long) with a hook at each end which the netted fish hang from as is shown opposite. When only the net is hoisted, the tare is negative, so the recorded weight is only for the fish in the net.

The weight of the nets is quite standard, and the largest variation noted was 4 kg.

3.3.2.4 Weight stabilization

Three main variables were identifying in terms of the time that take for weight stabilization as to be able to take the most accurate reading. These are:

3.3.2.4.1 Sling geometry

The long chain to the nets makes the nets “pendulum” and this affect the time it takes to stabilize the weight for reading. The long chains are needed as the crane taking the fish on board the carrier is “double cabled”(see picture). One cable does the lifting of the nets above the purse seiner up the height of the carriers, then the other cable moves the sling on board the carrier and gradually takes the listing role when getting the nets into the carriers fish hold. The roles gets reversed when the empty nets are coming back the PS.



When two nets are hoisted, (as in the picture above) this seems to increase the instability and it takes bit longer to read the weights. Operationally the chains are need, so it not be possible to change this setup.

3.3.2.4.2 Weather

Is a fact of life that weather affects all fishing activities and this includes transshipment. Wind and swell do affect the stability of both the slings in the first instance and the vessels in the second, even when in “protected anchorages”. If the bad weather is associated with rain, then transshipment stops as the fresh water ‘glaze” that forms on the fish makes the fish stick together when refrozen inside the carrier which in turns makes carrier unloading really difficult). There may also be a slighter higher

margin of error when transshipping in bad weather as total stabilization may be impossible.

3.3.2.4.3 Operational constrains

Although the crew interest is discussed in section 3.3.2.1, the reality is that the faster the turnaround of the vessels the better for everyone. In fact, many crews get a bonus if the unloading takes less than an agreed number of days (i.e. 4 to 6 based on size), therefore the monitors don't want to take up too much time so the best procedure is to read the most stable number in a period of 10 to 15 seconds maximum and let the sling go. In general terms the estimated margin of error can be around 10 kg per ton

3.3.2.4.4 Setting up scales and reading interruptions

Well sized and adjusted shackles seem to be sufficient for the scales, but the smaller they are the simpler their installation and in all cases the crew controlled the tightness of the shackles after every break. The idea of a backup safety chain was contemplated but did not seemed to be necessary at all.

Some of the weight readers show errors once the scale is out of line of sight when entering the hold of the carrier, but is easy to recover the reading once it emerges and comes back in line of sight

3.3.3 Best model

As discussed in section 3.2 the team set up a comparative demerit points-based matrix to evaluate the desirable characteristics of the scales. All models used where scored by consensus and the lowest count was the preferred one. A copy of the matrix is presented in table 1.

The best performing scale was the Ron 2501 Hook Type¹ - Crane Scale with Wireless Remote Display 3 Ton model. However, based on prior experiences with Korean vessels using bigger transfer nets and double slinging, the weight can potentially reach over 3 ton so the use of a 5 ton scale is recommended. This scale is the one on the left of the picture

Furthermore, after trial the manufacturer got in touch saying that they have released a Dampening/Averaging function on their remote display. This is a software option that is applied to the indicator, where instability in the lifted load is cyclical, such as in a load that swings in the manner of a pendulum. The dampening option can find the real weight in a relatively short time, before the load stops swinging. This option fits perfectly on our needs and further strengthened the choice of preferred scale.

It is also the smallest and lightest model of all in terms of scale and reader but also the strongest and the only one with AA removable batteries for both scale and readers with up to 2000 hrs of continuous use. This model can be purchased on line and has very good technical support. The only perceived issues is that at approx. 3400USD each, they are the 2nd most expensive model tested but the summary opinion of the team is that this model is still value for money because of its excellent performance.



¹ <https://www.eilon-engineering.com/code/2501/2501h.html>

			<i>Models</i>			
Attributes		Scoring	Ron 2501	SBWA	Intermercato	ESC-Sally
<i>Capacity in Metric Tons</i>			3	5	10	3
Motion compensated	Yes	2			2	
	No	4	4	4		4
Weight	1 - 2.5	1	1			
	2.6 to 5kg	2		2		2
	5 to 10	3				
	>10 kg	4			4	
Size	< .5m/ 1.60 ft	1	1			
	0.5 to 0.75 m	2		2		2
	0.75 to 1m	3				
	> 1 m	4			4	
resilience	equal to new	1				
	slight damage	2	2	2	2	2
	notable damage	3				
Sturdiness	all metal	1			1	
	metal>plastic	2	2			2
	protruding plastic	4		4		
Conectivity	Bluetooth (B)	4				
	Wifi (W)	2			2	
	To hand held reader (H)	3	3	3		3
	combination	1				
Vendor's capacity to collaborate	Easy	1			1	
	Medium	2	2	2		
	None	4				4
Easines of use	Easy	1	1			1
	Medium	2		2		
	Hard	4			4	
Battery replacement	common AA bateries	1	1			
	special batteries	2		2		
	vendor specific battery	3			3	3
Battery life (Days)	No replacement	4				
	>3	1	1		1	
	2 to 3	2		2		2
	1 to 2	3				
	< 1	4				
Price (US)	<500	1				1
	501 to 3000	2		2		
	3001 to 5000	3	3			
	>5000	4			4	
Totals			21	27	28	26

On the lower end, the Intermercato Intelweigh Compact 10MH scored poorly, primarily due to its weight, size and price, yet is a remarkable piece of equipment. While an “overkill” for transshipment monitoring, the team believes that there is a lot of potential for their use in at sea operations to be attached to the brail winch/cable/hook, while lifting the fresh catch on board from the purse seine net, as it could improve the “standard” brail fullness method of estimating catch. This is further discussed in section 3.3.7.

The other two models performed well, and while there is nothing particularly wrong with them, there is nothing particularly attractive about them either, other than in the case of the ESC-Sally the lowest price of any scale (240USD). The complexities around batteries replacement and a protruding plastic antenna in the SBWE, were the key less desirable characteristics in those models.

With all this considered, in the case of low budget availability, the ESC-Sally is worthwhile alternative to consider, as one could buy fourteen for the value of one Ron 2501.

3.3.4 Data Collection

The potential for connectivity options from the scales to Apps was a considerable topic of

discussions for the team, particularly under the initial assumption of seamless reading of weights, however, as discussed, this is not as easy as initially assumed. This is a matter for further exploration as EM technology moves forward as currently the potential for connectivity failure is high.

The majority of background data is already known at the time of boarding. This includes vessel details as well as catch volume estimates declared in the logsheet. The important matter of the catch wells fish hold well of s of origin was noted as this is important for the MSC Chain of Custody under compartmentalisation rules, which is a commercial issue and not a regulatory or science issue. It was thus not so important for as the technical team.

The key data is the weight of slings and the estimated catch composition of the slings, noting that more and more fish is sorted prior to loading into the transshipment nets.

The development of a specific app to have on tablets for port monitors could be considered, perhaps just based on an excel template where volumes are entered manually (under an autosave function) and then uploaded via Wi-Fi when back at the office or over the mobile network. The ability for the data entry to be geotagged, so as to prove that the monitor was on board is a further “verification” possibility.

The development of an app that connects directly to the port fishery authority IMS and to TUFMAN2, while providing access to secure PDF summaries for the masters of PS and carriers, is considered a necessity as to advance the project (more on this in section 3.3.7) and SPC has the technical capacity to undertake this work.

Support by SPC to its members involved in transshipment in port, for the creation of data collecting tools, management and transmission of data should be considered.

3.3.5 Strategy for deployment

While the scales have been identified as a very good tool for the job, they can only be effectively used as part of an overall port monitoring strategy and this presently does not fully exist in Majuro or in any port in the region.

3.3.5.1 Strengthening of the monitoring operations in transshipment ports

Monitors play a fundamental role in all the transshipping ports and this needs to be reflected in overall monitoring strategies. While the basics of the system are in place in Majuro, the present system is not really adding value for the cost incurred.

In a wider context, overall the monitoring efforts in the region do not really appear to be sufficiently well managed and there are ineffective systems for quality proofing the information provided.

It is considered that overall monitoring operations, logistics and management needs to be strengthened across the region and this needs to include a review of the whole system in each port and the development of enhanced operational management and improved coordination and management of port monitors.

For example, in Majuro the transshipments are supposed to be monitored from 7 am to 10 pm however there is currently no operational system to verify if the monitors are actually on board.

Unfortunately, there is ample evidence that some monitors are not on board during the expected working hours or not even on board at all, particularly over the weekends. However, as their logistics for boarding and disembarking is left over to the monitors and agents is very difficult to prove any non-attendance.

As discussed in regard to weight estimates in the absence of scales, these are based on the estimation of the weight in the “slings” passing from the FV to the carrier and are thus likely to be highly inaccurate. Once all the paperwork is completed on board and the forms are brought back to the boarding officers who then have to take them on face value and do the associated data entry.

This is seen as a very unproductive and inefficient way to operate and therefore the whole structure

will need reviewing if the investment on the scales is to produce the optimum results.

Ideally a specific section and/or a position for monitor coordination is needed within fisheries administrations in transshipment ports and the suggested tasks associated to that position are presented in section 3.3.7.1.

It is also recommended that the FFA Secretariat, where requested, undertake capacity building programs for improved monitoring programs in transshipment ports.

3.3.5.1.1 Staffing and working hours

In Majuro, the monitors are sourced from a list of available observers at and given time however limited control is undertaken over their work, and it is unclear whether non-performances is reflected in reflected remuneration.

There is a need to formalize all the monitoring operation via a code of conduct and standardised terms of reference for monitors will need to be developed along with a performance based payment schedule and there needs to be improved management of scheduling, shift allocations, as well as systemised provision and collection of equipment. Also, while well intended, having working hours from 7am to 10pm if not enforced or controlled means that the system is conducive to abuse and MIMRA is paying for hours not worked.

Hence either the monitors working hours and the work of the boarding officers in charge of their control need to be either (1) effectively managed in the 7.00am – 10.00pm, or (2) be adapted to MIMRA's standard office hours (8am to 5pm).

Option 1 is preferred as it covers the whole transshipment and the full weight of catches. One consideration to support this is to have the monitors hosted on board, which is possible since normally the designated trip observer will have already disembarked. In the case of the observer doing back to back trips some alternative arrangement may be needed.

Option 2 is less preferable since it requires calculation of the volumes monitored during the administration working hours and then calculating a correction factor for the data provided by the mates receipt and/or the logsheet outside of working hours.

3.3.5.1.2 Rugged Tablets and e-forms/Apps

As discussed above (3.3.4), the present practices are based on paper forms and the present forms are of limited value and need to be reviewed in the context of what information really needs to be collected.

Having the forms as e-forms or as an app for rugged tablets supplied to monitors for their daily work with data unloaded by WIFI to the IMS and tablets recharged overnight back on land would be a much improved and paperless system.

3.3.5.1.3 Managing the deployment of the scales

The crane scale equipment (*owned by the fisheries authority*) can be carried on board before the start of transshipment and linked to crane hook as a condition of transshipment. The scale is "tared" by using putting two cargo nets lifting the whole sling with the nets above deck level and taring to zero.

The fisheries authority should have sufficient scales based on the maximum number of vessels transshipping at any one time. In some instances when two vessels are transshipping at once, two scales will be needed on board.

The monitor is responsible for the scale, and the tablet and their return to base, as well to make sure the batteries are maintained charged.

3.3.6 Training and resources required for roll out

Due to the simplicity in the operation of the scales, the training required for the operation of the

scales is basic however it also needs to include a data component and potentially training in the use of the App for data collection.

The training can be likely be delivered in a two-day program which includes an initial day of theory to acquaint with the scales, their manual and the data acquisition App/eform and also the expectations of monitor performance and the role of the monitor coordinator role (as discussed in section 3.3.5.1).

The second day would be on board a vessel in a supervised capacity to undertake actual monitoring.

Given that the monitor role is primarily filled by observers, consideration could be given to developing a specific monitoring module for PIRFO observer training and it could provide a . further employment opportunity for observers while not on board.

3.3.7 Potential problems, solutions and further work

3.3.7.1 Port Monitor's Coordination

As discussed earlier, strengthening the management of monitors is fundamental to the potential benefits associated to the adoption of the use of the crane scales.

Fisheries administration in the countries where transshipment takes place need to consider making this an area of focus.

This can be either as a section inside the administration (either compliance, port operations or observer management) or as a stand-alone and even subcontracted service.

The monitors coordination role includes at minimum:

- 1) *Assign qualified port monitors to transshipping /unloading vessels.*
- 2) *Liaise with Ports Authority and other relevant offices on acquiring annual Port ID badges and relevant port use information/practices.*
- 3) *Assess completed port monitoring forms and investigate discrepancies across relevant documents.*
- 4) *Enter/sync (if/when with tablets) completed port monitoring forms into the national IMS > TUFMAN2.*
- 5) *Generate port monitoring payment forms from and submit to accounting department.*
- 6) *Log, track and maintain all equipment used for port monitoring purposes. (Tablets, life jackets, vests, boats, etc.)*
- 7) *Generate monthly (and upon request) transshipment/unloading reports.*
- 8) *Generate detailed port monitoring reports and analysis for transshipment /unloading data on species composition, activities by flag, temporal trends, etc. (upon request)*
- 9) *Generate report on flag vessels transshipment / unloading in other ports. (upon request)*
- 10) *Maintain port monitoring data base and assist with export document verification upon request*
- 11) *Liaise with national observer office on training new observers for port monitoring.*
- 12) *Liaise with PNAO on MSC port monitoring certifications and MSC standards for port monitoring and cold storage monitoring.*

3.3.7.2 Potential for Cost Recovery

The resourcing for any operational activities such as port monitoring is always one of the key challenges for Pacific Island nations. Across FFA membership MCS staff generally share a range of functions and priorities and staff are often brought in on short or fixed term contracts when new positions are created due to the fact that the certainty of long term funding cannot always be assured.

In some cases, where resourcing rates are higher, such as in PNG, there are still some challenges around the management and coordination of these resources and particularly ensuring coverage across all operational times (such as weekends).

The biggest contributor to the challenges around resourcing are the funding mechanisms, and particularly the existence of insufficient cost recovery mechanisms. This is tied broadly to the recognition that vessels entering the ports and fisheries waters in the Pacific do not have the right to do so and so need to request and seek authorisation. This imposes costs on to the coastal and port States so it is important for these States to ensure that these costs are covered by the vessels entering ports and States entering in to agreements.

As discussed in section 3.3.2.1 the volumes determination can be seen as service to operators and therefore cost-recovered via a levy per transshipment. Tuvalu successfully runs such a scheme including a differential charging for MSC labelled products as it requires the use of resources and staff for an activity that is commercial in nature (i.e. brings an economic benefit to the operators), and sits outside the regulatory and science realms of government.

Adoption of a monitoring levy as a cost recovery option is something strongly encouraged provided it can be based on a strong and reliable service provision with transparency in the data sharing to all interested parties.

3.3.7.3 The use of scales during brailing

The team discussed the potential on the use of these scales in at sea operations to be attached to the brail winch/cable/hook, while lifting the fish on board from the purse seine net as it could improve the “standard” brail fullness method of estimating catch.

It should be noted that this is a very interesting option which could be pursued by an ad hoc independent project perhaps spearheaded by SPC. The key beneficiaries would be both the vessel operators and the data collectors.

It is suggested that either the Intermercato Intelweigh Compact 10MH with 10 to capacity could be used, but as well the 15 ton model of the Ron 2501 with the dampening screen are best suited to this task. (

4 Acknowledgments

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5 Summary and recommendations

Effectiveness of use and best model

- The use of scales for better determining the weights transhipped as part of the monitoring effort is a viable option that increases the accuracy of weights recorded. Hence their incorporation to the monitoring routines of transshipment ports is recommended. The scales (to be owned by the fisheries authority) can be carried on board before the start of transshipment and locked to crane hook as a condition of transshipment.
 - Interestingly in every single case monitor (and sometimes winchman) estimates were higher than the scale weight, hence overreporting (consistently above 10% in weight) is much more prevalent than underreporting.
 - The best performing scale was the Ron 2501 Hook Type - Crane Scale with Wireless Remote Display 3 Ton model. Based on prior experience with Korean vessel transshipment where the use of double slings is common and potentially be more than 3 tons, the option for use of a 5 ton scale is suggested. Also, in the case of low budget options, the -Sally is a worthwhile alternative to consider.
 - Operational constraints about weight reading stabilisation in relation to slings geometry, weather, swell, taring of scales and reading interruptions are manageable challenges.
- FFA member countries involved in transshipments in port, should explore procurement options and the adoption of the use of crane scales as a standardised procedure.

Support of operators

- Crew and masters of PS and carriers welcome the fact that the transhipped volumes are evaluated “independently” by the regulator, since it removes the perceived bias around interested parties. In general, they are happy to have the monitors on board even if the transshipment takes bit more time, as long as the results are shared, which is in principle a good and transparent practice. This is to be seen as a great opportunity, and potentially a cost recovered service offered to the fleet at port, but also a big responsibility that will require to change the whole monitoring practice from an operational and management perspective.
- Support of vessels operators is guaranteed, as long as they get transparency in the receipt of volumes transhipped

Preconditions for effective monitoring operations

- For the use of crane scales to be effective and welcomed by operators a substantial operational, logistical and managerial strengthening of monitoring operations is needed. This has to include a review of the whole monitoring management system and improvements in the general management of the operations and the contracted monitors as well as logistics and equipment. It should include the creation of a monitors coordinating position, this can be either as a section inside the administration (either compliance, port operations or observer management) or as a stand-alone and even subcontracted service.
 - Monitors working hours and the work of the boarding officers in charge of their control need to 1) extend to 7am to 10pm, or 2) adapt to office hours (8am to 5pm).
 - Option 1 would be the preferred since it would cover the whole transshipment and the full weight of catches. For this option it may be possible to host the monitor on board, provided the at sea observer has already disembarked. In the case of the observer doing back to back trips some alternative arrangement may be needed.
 - Option 2, would be less preferable since it will require calculation of the volumes monitored during the administration working hours and then calculating a correction factor for the data provided by the mates receipt and/or the logsheet for after hours
- Support by FFA to its member involved in transshipment in port, for the organization and management of the monitoring systems is recommended

Data collection

- The development of an app that connects directly to the port fishery authority IMS and to TUFMAN2, while providing access to secure PDF file summaries for the masters of PS and carriers would be a very useful development and could be tasked to SPC.
 - Having the forms as e-forms or an app into rugged tablets to be provided to monitors for their daily work, and then recharged back in the office with forms automatically unloaded via WIFI would provide a paperless system.
- Support from SPC to members involved in transshipment in port for the creation of data collecting tools, management and transmission of data should be considered.

Training and PIRFO standards

- Due to the simplicity in the operation of the scales, the training required for the operation of the scales is basic however it also needs to include a data component and potentially training in the use of the App for data collection.
 - The training can be likely be delivered in a two-day program which includes an initial day of theory to acquaint with the scales, their manual and the data acquisition App/eform and also the expectations of monitor performance and the role of the monitor coordinator role The second day would be on board a vessel in a supervised capacity to undertake actual monitoring.
 - Given that the monitor role is primarily filled by observers, consideration could be given to developing a specific monitoring module for PIRFO
- Combined support from FFA and SPC to members involved in transshipment in port, for the training of monitors and the potential incorporation of monitoring tasks as part of the PIRFO Observer Competency Standards is recommended.

Operational Cost recovery

- The option for monitoring levy as a cost recovery option is something strongly encouraged based on the provision of a quality service which includes timely and transparent data sharing.

Use of scales at sea during brailing

- The use of crane scales during at sea operations could improve the “standard” brail fullness method of estimating catch. The key beneficiary would be the science section, the observer programme, and the vessel operators.
- The technical team suggest that this is a very interesting option which could be pursued by an *add hoc* independent project perhaps spearheaded by SPC in partnership with Industry.

6 Appendix

6.1 *Pictures of the trial*

side to s

Clockwise: team during work, Ron 2501, ESC sally and slings, Intermecato (pic bY Malo), Esc, Sally, Hellas and Ron

Links to Video of operation: <https://youtu.be/xobc8wg8jO8>