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Fisheries Observers Preliminary Assessment of Purse Seine / Ring Net Fishing in Phillipine Major Fishing Grounds During the FAD Fishing Closure CY 2010

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Abstract

In line with the implementation of WCPFC Conservation and Management Measures (CMM 2008-01) entitled the Conservation and Management Measures for Bigeye and Yellowfin tuna in the Western and Central Pacific Ocean, the Philippines implemented Fisheries Administrative Order 236 entitled "Rules and Regulations on the Operations of Purse Seine and Ring Net Vessels Using Fish Aggregating Devices (FADs) locally known as Payaos during the FAD Closure Period as Compatible Measures to WCPFC CMM 2008-01", to check and validate the reduction of catch on Bigeye and other tuna species by reducing the net depths of the inspected and accredited cooperating Philippine flagged vessels operating in the Philippine EEZ. The Order also required the deployment of BFAR Fisheries Observers during the period July-September 2010 and 2011.

This study was based on Fisheries Observers data collected from 69 purse seine and ringnet catcher boats based in General Santos City, Philippines. It involved the deployment of 30 National Observers covering a total of 431 sets or operations of purse seines and ringnets within the EEZ in major fishing grounds in the Philippine Sea (Pacific seaboard), Mindanao Sea (Celebes), West Philippines Sea and Sulu Sea. The methods adopted are total catch estimation from brails, fullness of fish holds and consultations with boat officers and crew; catch sampling and sub sampling methods which includes sorting, species identification, and size measurements. Other parameters such fishing grounds and fishing gears performance were observed. As a result, attempts were made to evaluate catch variations in relation to fishing grounds, fishing grids, depth of nets, type of gears and month. The outcome of this preliminary study will serve as the basis to recommend workable measure/s to improve and amend the existing Fisheries Administrative Order and formulate other compatible measures/national regulations to WCPFC CMM 2008-1 in support to sustainable management and production of big eye tuna and other tuna and tuna like species.

I. BACKGROUND

Being one of the major tuna fishing nations in the West Central Pacific Ocean (WCPO), the Philippines has been a chief party to the negotiation and adoption of the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean that subsequently established the Western and Central Pacific Fisheries Commission (WCPFC). In the performance of its mandate to manage migratory fish stocks in the WCPO, the Commission implements various Conservation and Management Measures (CMMs) covering the Convention area.

Conservation and Management Measure (CMM) 2008-01 seeks to implement compatible measures for the high seas and EEZs to maintain bigeye and yellowfin tuna stocks at levels capable of producing MSY. Among the prescribed measures is for purse seine fishery in the area bounded by 20ºN and 20ºS closed to fishing on FADs August 1- Sept 30, 2009 and July 1- September 30 in 2010 and 2011. During this period, all purse seine vessels are required to carry an observer from the Regional Observer Program.

The Philippines being a non-PNA country implemented Fisheries Administrative Order 236 entitled "Rules and Regulations on the Operations of Purse Seine and Ring Net Vessels Using Fish Aggregating Devices (FADs) locally known as Payaos during the FAD Closure Period as Compatible Measures to WCFPC CMM 2008-01". The Order applies to all Philippine registered and licensed commercial purse seine and ring net catcher vessels that fish on FAD within Philippine EEZ from July 1 to September 30 of 2010 and 2011. It also requires registration with BFAR for authorization to fish on FADs during the period and depth of net not more than 115 fathoms stretched to reduce the catch of bigeye tuna. It also entails vessels to carry on board Monitors (Observers) to gather data and recommend further improvements of the measure.

In addition, CMM 2007-01, also obliged the Commission to develop a Regional Observer Programme to, among others, collect verified catch data, and to monitor the implementation of the conservation and management measures adopted by the Commission.

With the above CMMs and FAO, the Philippines initiated to establish its Observer Program that started with a Fisheries Observer Training course and establishment of the Philippines Fisheries Observer Program-Management Office (PFOP-MO) in 2009 at the BFAR-MCS and Fishing Technology Station, Navotas, Metro Manila. As of December 2010, 106 Fisheries Observers have been trained mainly BFAR technical staffs and other graduates with at least BS degrees in Fisheries, Marine Biology and other related courses.

This report covers preliminary findings and recommendations during the collection of fisheries data by Observers on purse seines and ringnets operating within the Philippine EEZ during the period July 1 to September 30, 2010.

II. IMPLEMENTATION AND COVERAGE

The deployment of observers covered the 3-months FAD fishing closure period from July 1 to September 31, 2010 involving purse seine and ring net catcher boats based in General Santos City. It was implemented in consultation with boat owners and affiliated Organizations particularly the SOCSKSARGEN Federation of Fishing and Allied Industry, Inc. (SAFAII). One Observer trip covered one catcher vessel for a period of 20 days inclusive of travel to and from fishing ground to port of fishing landing. Each trip was designated with a distinctive number. Each registered vessel was required with at least one observer trip during the entire 3-month period with compensation provided for by boat operators.

Information collected by Observers included catch, species and size composition, fishing position, sex & maturity, condition when fish were caught (retained or discarded), fishing gear designs, methods of operations, support vessels (carrier, light boats, tenders, etc.), electronic equipment and deck machineries, communications and VMS, Fish Handling Onboard (types and techniques) and Vessel Details/Particulars (Engine, Length, Tonnage, Auxiliary machineries, etc.).

Briefing and de-briefing sessions were conducted by the BFAR PFOP-MO prior and following each deployment.

In order to standardize collection and easy processing of data, eight forms were devised. Forms were patterned to the minimum data standards set by the Western and Central Pacific Fisheries Commission with some modifications to conform to data requirements on the PFOP.

Observers were equipped with basic equipment and recording system that included Netbook, Global Positioning System (GPS), digital cameras, measuring devices (board and tapes) and weighing scale. Species identification manual was given to observer to properly identify the species gathered. Other information was obtained from the vessel's documents, interviews with boat officers and crew.

III. METHODS

1. Total catch estimation

Total catch estimates were derived basically from three methods. The most important procedure was made by counting and estimating the capacity of brails as fish catch was transferred from the bunt of the net to wells/fish holds of awaiting carriers. Estimation was also based on capacity and fullness of wells/fish holds. Other Observers relied on standard estimates as practised by experienced/in-charge boat officer.

In the capacity and count of brail method, total catch was estimated using the following formula:

Volume (V) = $\pi r^2 h$
Brail capacity = Volume x 80%

Where;
$\pi = 3.14$
h= Brail height
r = Brail diameter (d)/ 2

The volume of fish is estimated approximately 80% of the volume of the brail or well to account open and water space. By using this method, a margin of +/- 2% error was observed (dela Cruz, 2010).

B. Catch Sampling & Sub-sampling method

Random technique was carried out in sampling the catch. Samples were collected using tub or pail as the brail is emptied into the well or scooping the fish from the bunt during brailing or from fish holds/wells. Further sub-sampling procedures were also conducted when necessary.

Samples were sorted according to group or species whenever possible, weight to the nearest 0.1 kg and length to the nearest cm (fork length for tuna and large pelagic species and total length for small pelagic and other species).

C. Species identification

Species identification was provided to Observers based on available identification guides. Special attention was given on the distinctive characteristics of small size yellowfin and bigeye tunas.

D. Data processing and analysis

Sets or operations were classified according to fishing grounds (FGROUND) that included the Mindanao Sea in the Celebes (CEL), Southern Portion of the Philippine Sea in the Pacific Seaboard (PAC), Central-South Sulu Sea (SS) and in the vicinity of the Kalayaan Group of Islands in the West Philippine Sea (WPS). The Celebes and Pacific were further subdivided into smaller fishing grids (FGRID).

Depth of nets (NDEPTH) were grouped (irrespective of gear type) with class intervals of 20 fathoms. Information on the depth of nets was taken from inspection reports conducted by the BFAR-Fisheries Regulatory and Quarantine Division (FRQD) prior to FAD closure period, as well as information provided by Masterfishermen.

Comparison of mean catches by fishing ground (FGROUND), fishing grid (FGRID), depth of net (NDEPTH), type of gear (GTYPE) and month (MONTH) were done. Mean catch was determined on per set basis that included total catch (TOTAL), skipjack (SKJ), yellowfin (YFT), bigeye (BET) and mackerel scad (MSD). The mean length (FL) of SKJ, YFT, BET and MSD were also determined and compared.

Data record and processing were done on MS Excel and Statistical analysis (*One-way ANOVA, Post hoc/LSD test)* with STATISTICA software.

IV. RESULTS

A. Catch, species and size composition

This report covers data from 30 observers involving 431 sets made by 69 catchers which resulted to an aggregate catch of 3,044 metric tons or an overall mean catch of 7.1 tons/set. Mean catch rates for skipjack, yellowfin, bigeye and mackerel scad were 2.9 t/set, 1.2 t/set, 0.16 t/set and 1.6 t/set respectively.

Dominant catch were skipjack (*Katsowonus pelamis*, 41.5%), mackerel scad (*Decapterus macarellus*, 22.5% and yellowfin tuna (*Thunnus albacares*, 16.8%). Big eye tuna was about 2.3% of the catch. Other species caught were rainbow runner (*Elagatis bipinnulatus*), eastern little tuna or kawa-kawa **(***Euthynnus affinis*), bigeyed scad (*Selar crumenopthalmus*), frigate tuna (*Auxis thazard*), bullet tuna (*Auxis rochei*) and other minor species (Fig. 1).

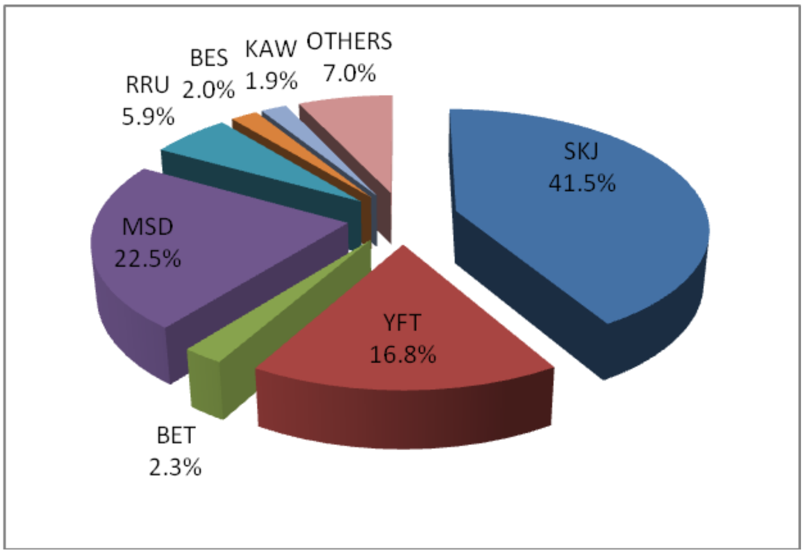
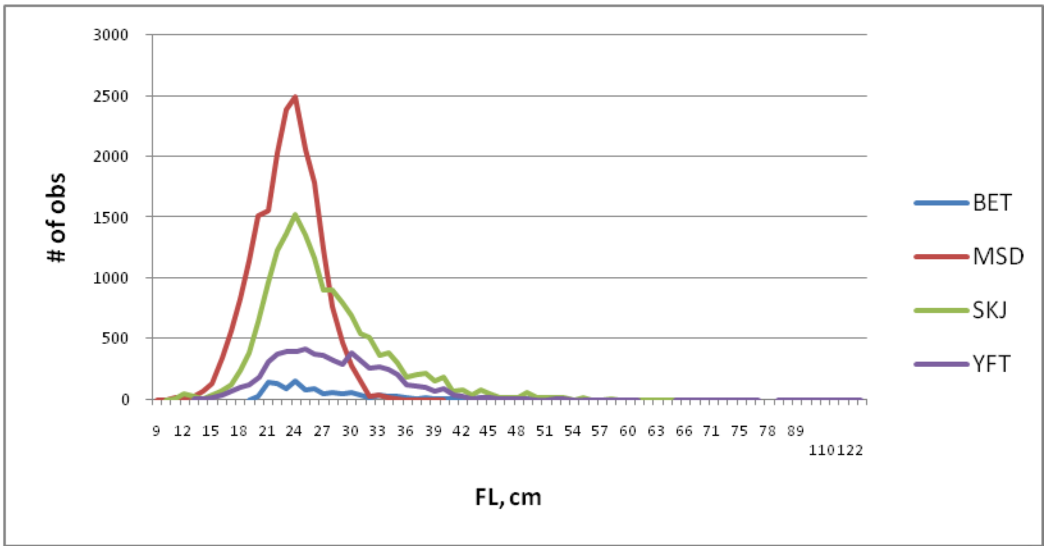


Figure 1. Catch composition of purse seine and ringnets

The length frequency distribution of skipjack, yellowfin, bigeye and mackerel scad are shown in Figure 2. For skipjack, size ranged from 10 to 77 cm with mean length of 27 cm. The equivalent size ranges and mean lengths for yellowfin, bigeye and mackerel scad were 11-159 cm and 28 cm, 15-78 cm and 28 cm, and 9-40 cm and 23 cm respectively. This just emphasized that bulk of tunas caught by the fleet were essentially small and of comparable sizes.



Breakdown Table of Descriptive Statistics (LF_ALL1.sta)
N=43872 (No missing data in dep. var. list)

SP	FL (cm) Means	FL (cm) N	FL (cm) Minimum	FL (cm) Maximum	FL (cm) Q25	FL (cm) Median	FL (cm) Q75
SKJ	26.98375	16243	10.00000	77.0000	23.00000	26.00000	30.00000
YFT	28.30894	6231	11.00000	159.0000	23.00000	27.00000	32.00000
BET	28.27294	1297	15.00000	78.0000	23.00000	26.00000	31.00000
MSD	23.06985	20101	9.00000	40.0000	21.00000	23.00000	25.00000
All Grps	25.41683	43872	9.00000	159.0000	22.00000	24.00000	28.00000

Figure 2. Length frequency distribution of major species caught

B. CATCH VARIATION BY FISHING GROUND (FGROUND)

The fleet operated in four (4) fishing grounds, namely the Mindanao Sea in the Celebes (CEL), the southern portion of the Philippine Sea in the Pacific Seaboard (PAC), central-south Sulu Sea (SS) and the West Philippine Sea (WPS) particularly in the Kalayaan Group of Islands. The Celebes and Pacific were the most frequented fishing grounds, obviously because of their proximity/accessibility from the fleet's homeport in General Santos. The observations from these fishing grounds comprised 96% of the total observed sets (Table 2).

Table 1. Distribution of sets by fishing ground

FGROUND	CEL	PAC	SCS	SS	Total
No of Sets/obs	293	119	15	4	431

By fishing ground, higher relative composition (%) for the tuna species was observed in the Pacific compared to Celebes, but mackerel scad is relatively higher in the latter than in the former fishing ground (Fig. 3) .

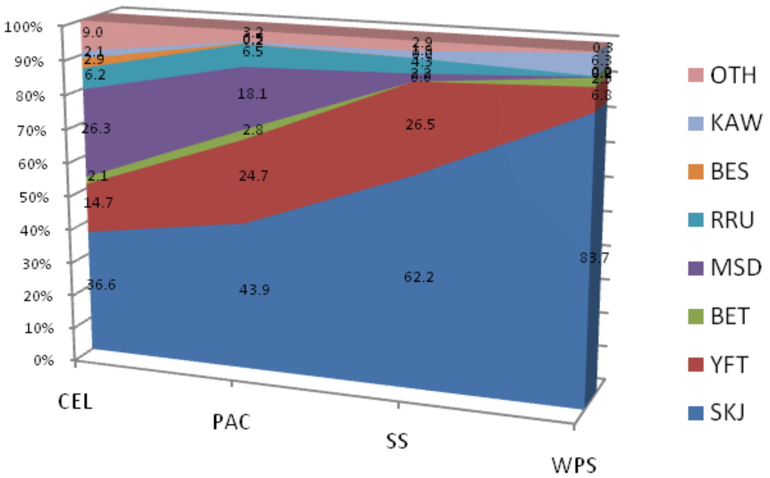


Figure 3. Relative catch composition by fishing ground

Analysis indicated that mean total catch and mean catch by species (except bigeye) and their respective mean MeanLengths differed across fishing grounds (Fig. 5). The mean total catch from sets made in the West Philippine Sea and Sulu Sea were highest at 11.6 t/set and 11.2 t/set respectively, however, the reliability of these figures have to be further validated due to the limited operations made in these areas. Nevertheless, there was no significant difference between mean total catch in the Celebes (7.1 t/set) and the Pacific (6.2 t/set).

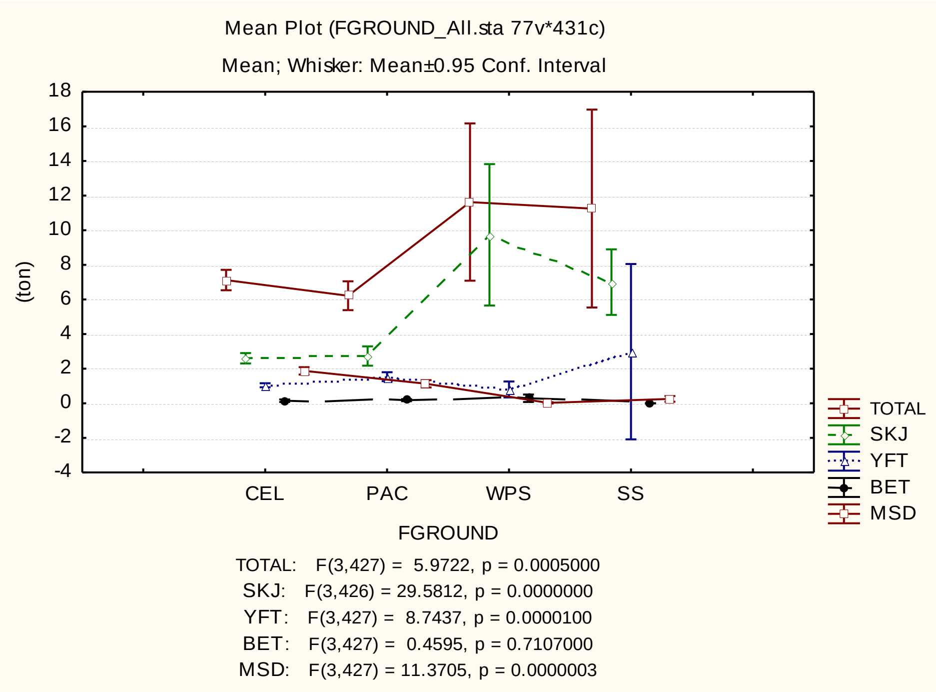


Figure 4. Mean total catch by fishing ground

On the catch by species, mean catch of SKJ was highest from the few operations in the West Philippine Sea (9.7 t/set) and Sulu sea (6.9 t/set) while catch in the Pacific (2.7 t/set) was not statistically different from Celebes (2.6 t/set). Different situation was however observed with YFT where higher catch from the Pacific (1.5 t/set) was highly significant (p=0001) compared to Celebes (1.0 t/set). The same was however not observed with BET where mean catch were not different across fishing grounds. Higher catch for MSD in the Celebes (1.9 t/set) was also highly significant (p=0.00003) compared to the Pacific (1.1 t/set) as well as with other fishing grounds.

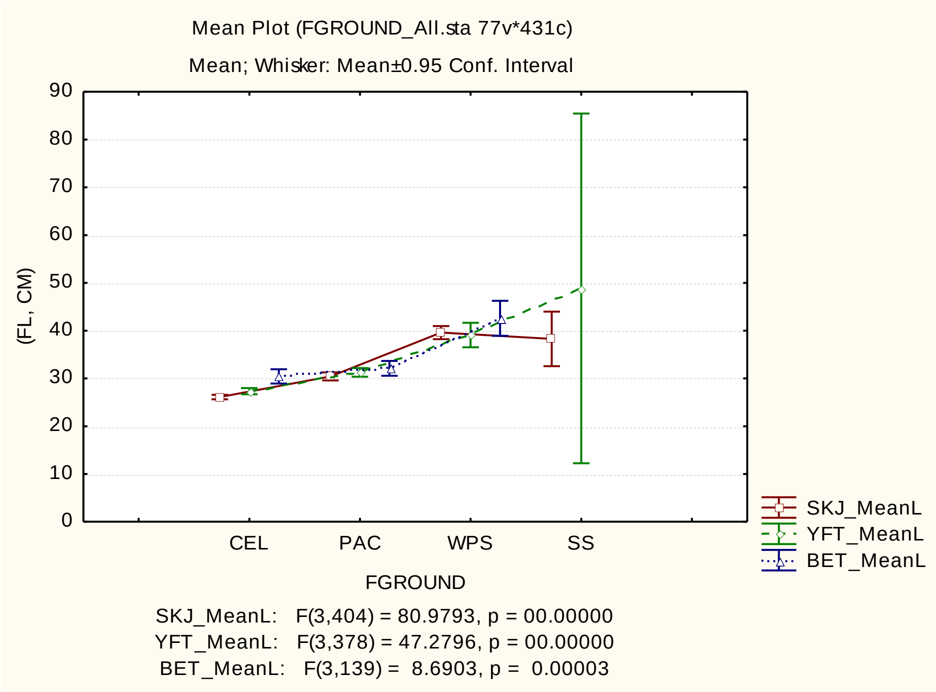


Figure 5. Mean mean length (FL) of SKJ, YFT and BET by fishing ground.

Significant differences on the mean MeanLength of the 3 tuna species were similarly noticeable across fishing grounds (Fig. 6). The mean MeanLength of SKJ was smallest in the Celebes (26.1 cm) compared to sizes from the PAC (30.4 cm), WPS (39.6 cm) and SS (38.2 cm). Similar observation was also true with YFT.

The details of post hoc/LSD test by fishing ground (FGROUND) are presented in Appendix 1.

C. CATCH VARIATION BY FISHING GRID (FGRID)

Attempt was also made to identify variations with more specific fishing grids within fishing grounds. Fishing grounds were subdivided into 11 fishing grids with five grids in Celebes Sea (C1, C2, C3 C4 and C5), four in Pacific (P1, P2, P3, P4) and one each in West Philippine Sea and Sulu Sea. The distribution of observed sets by fishing grid (FGRID) is presented in Table 3.

Table 2. Number of observations by fishing grid (FGRID)

FGrid	C1	C2	C3	C4	C5	P1	P2	P3	P4	SCS	SS	Total
No of obs	59	76	63	34	61	54	19	23	23	15	4	431

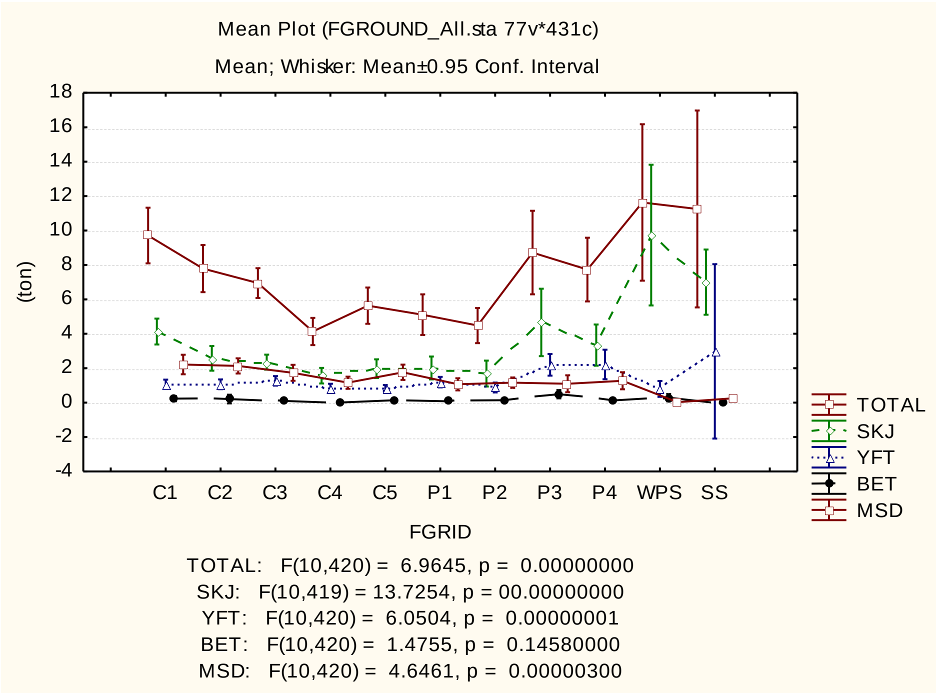


Figure 6. Mean catch by fishing grid.

Similarly with the observation across fishing grounds, catch variations were noticeable across fishing grids except for BET (Fig. 7). Significantly higher mean total catch was realized in grids found in the southern limits of the Celebes with C1 (9.7 t/set) C2 (7.7 t/set) and C3 (6.9 t/set) as well as the higher latitudes of the Pacific with P3 (8.7 t/set) and P4 (7.7 t/set). Total catch in the West Philippine Seas (11.6 t/set) and Sulu Sea (11.2 t/set) grids were higher compared to grids in the Pacific and Celebes.

For SKJ, high mean catch were observed in C1 (4.1 t/set), C2 (2.5 t/set), P3 (4.7 t/set) and P4 (3.3 t/set). On YFT, P3 (2.2 t/set) and P4 (2.2 t/set) which are located in the higher latitudes (off Surigao-ESamar) in the Pacific were significantly higher compared to other grids in the Pacific and Celebes. P3 also registered the highest mean catch of BET (0.49 t/set) and significantly higher compared all grids in the Celebes and Pacific except C1 (0.23 t/set).

On the other hand, C1 (2.2 t/set) and C2 (2.1 t/set) which are located in the southern limits of the Celebes and off Jolo and Tawi-tawi demonstrated highest mean catch for MSD and significantly higher than all grids in the Pacific, West Philippine Sea and Sulu Sea.

The variation on the sizes of fish across fishing grids reiterated the clear variations with fishing grounds. The mean MeanLength SKJ and YFT grids in the Pacific were significantly bigger than those that were from grids in the Celebes (Fig. 8).

The details of post hoc/LSD test by fishing grid (FGRID) are presented in Appendix 2.

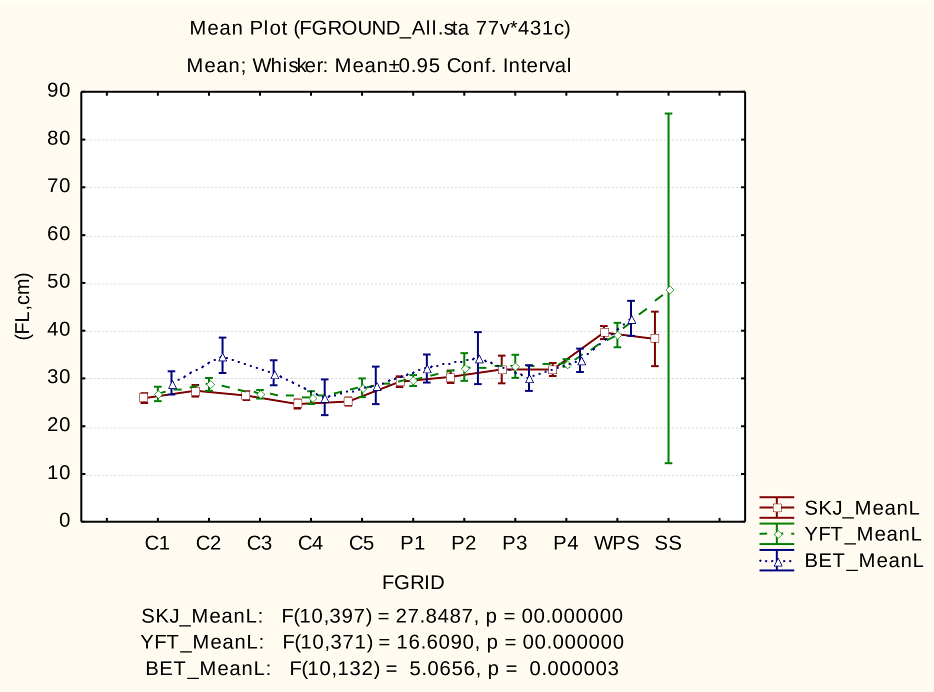


Figure 7. Mean MeanLength (FL) of skipjack, yellowfin and bigeye by fishing grid.

D. CATCH VARIATION BY DEPTH OF NET (NDEPTH)

Analysis on the variations of catch with depth of net was focused on sets made in the Celebes ad Pacific where 95% of the observations were made. The actual depth of nets ranged from 64 to 115 fathoms. The nets were classed by 20 fathoms, in particular 101-120 fm (Class 1), 81-100 fm (Class 2) and 61- 80 fm (Class 3). The distribution of observations by depth class is shown in Table 4.

Table 3. Number of observations by depth of net by fishing ground.

NDEPTH (fm) / FGROUND	CEL	PAC	Total
101-120	119	88	207
81-100	151	31	182
61-80	23	-	23
Total	293	119	412

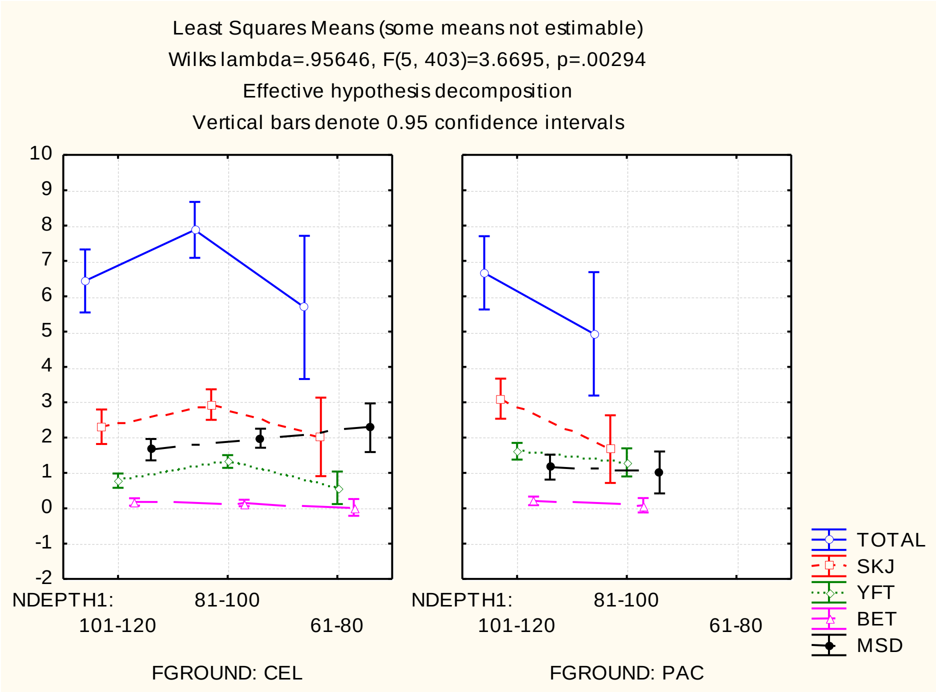


Figure 8. Mean catch (t) by species by depth of net by fishing ground

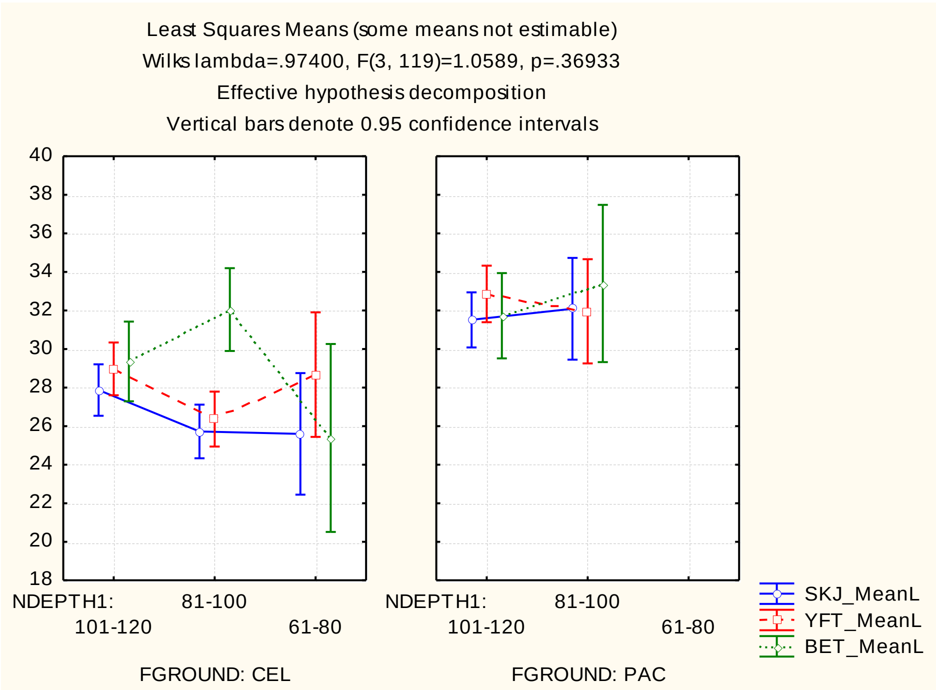


Figure 9. Mean MeanLength of tuna species, Celebes and Pacific

Catch variations were observed across gear depth class (Fig 9 and 10) . In the Celebes Sea, the mean total catch (5.7 t/set) of shallowest net (Class 3) was lowest compared to deeper Class 1 (6.4 t/set) and Class 2 (7.9 t/set) nets. Similarly, mean catch for YFT was significantly lower in Class 3 compared to Class 2 nets. There was no significant difference on the mean catch of SKJ and MSD across net depth classes.

In the Pacific, difference was only observed on SKJ and MSD where catch of Class 1 nets was significantly higher than Class 2 nets (81-100 fm). Mean MeanLength of YFT and BET were similar across the different depth of nets.

In both fishing grounds, there was a general decrease on the mean catch of BET with decreasing net depth class but statistically insignificant (Appendix 3). Nevertheless, attempt was made to calculate reduction by using linear regression based on pooled data from Celebes and Pacific which indicate that reduction of nets from depths of 125-130 fathoms to the maximum of 115 fathoms requirement of FAO 236 may possibly realized around 32% catch reduction of bigeye tuna (Table 5). This approximation however should be validated with subsequent observations

Table 4. Mean catch of BET by depth of net (pooled Celebes and Pacific)

NDEPTH_range (fm)	NDEPTH _Midpoint	Mean Catch (t/set)	% Reduction
121-140	130	**0.2836***	
101-120	110	0.1926	**32.07**
81-100	90	0.1306	**32.19**
61-80	70	0.0252	**80.71**

*Predicted value by linear regression

The details of post hoc/LSD test by depth of net (NDEPTH) are presented in Appendix 3.

E. CATCH VARIATION BY TYPE OF GEAR

Table 5. Number of observations by gear type (GTYPE) and fishing ground (FGROUND)

GTYPE/FGROUND	CEL	PAC	Total
PS	46	73	119
RN	247	46	293
Total	293	119	412

The association of catch and type of gear was indistinct with contrasting results from the two fishing grounds (Fig. 11). This may indicate that gear type (purse seine or ringnet) is not as very important factor on efficiency. The only distinction is the use of power block or mechanized hauling in purse seine, but the size of boats and nets are mostly similar.

In the Celebes mean total catch was higher in purse seine (10.4 t/set) than ringnet (6.5 t/set) while it is the opposite in the case of Pacific operations with higher ringnet mean total catch (8.1 t/set) than purse seine (5.0 t/set). This relationship was also similar for SKJ and YFT in the Pacific. The mean catch of BET is higher in purse seine than ring nets in both fishing grounds but similarly not statistically significant.

Smaller sizes of SKJ was observed on purse seine (24.8 cm) compared to ringnets (27.6 cm) in the Celebes while there was no difference on the sizes of tunas caught between the gears in the Pacific

The details of post hoc/LSD test by gear type (GTYPE) are presented in Appendix 4.

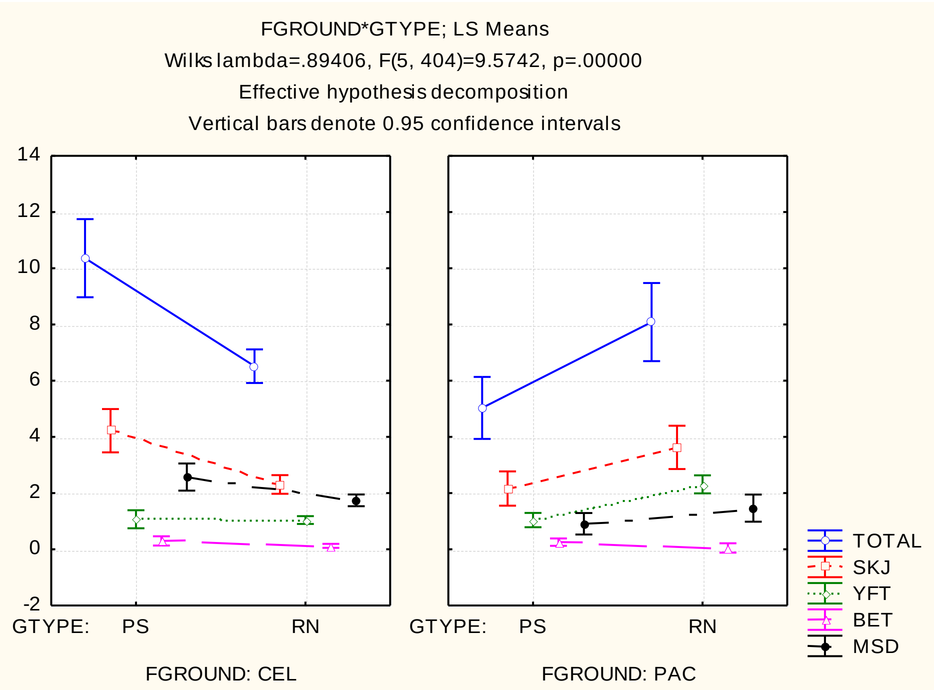


Figure 10. Mean catch by gear type

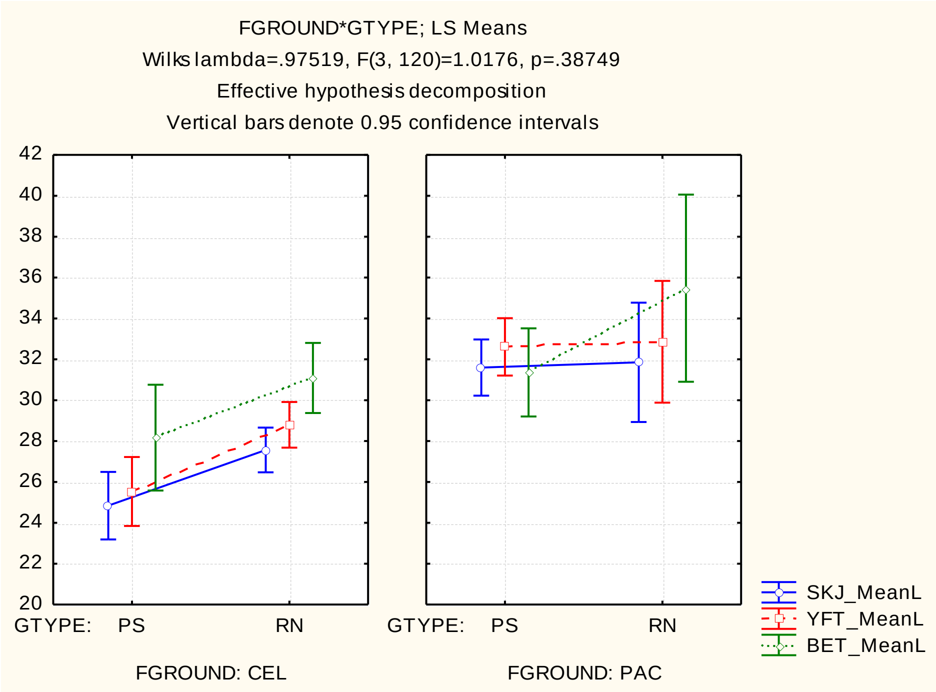


Figure 11. Mean MeanLength by species by gear type (GTYPE) and fishng ground (FGROUND)

F. CATCH VARIATION BY MONTH

Table 6. Number of observations by month (MONTH) and fishing ground (FGROUND)

MONTH/FGROUND	CEL	PAC	Total
Jul	108	42	150
Aug	170	71	241
Sep	15	6	21
Total	293	119	412

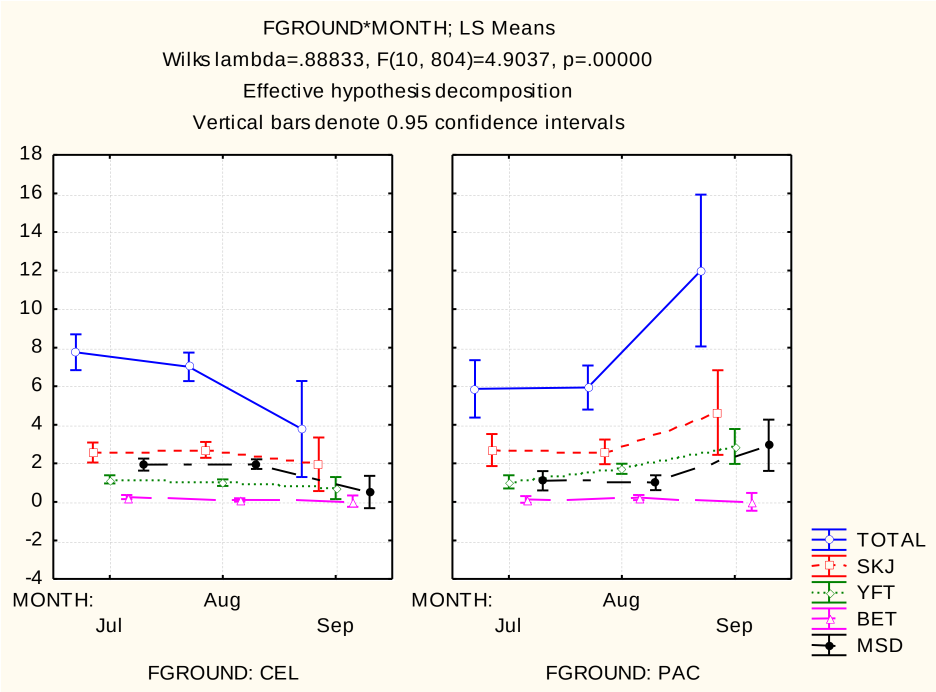


Figure 12. Mean Catch by MONTH and FGROUND

Mean total catch in the Celebes was significantly lower (3.8 t/set) in the month of September compared to July (7.8 t/set) and Aug (7 t/set). This relation was also observed in the catch of MSD. The catch of other species were not different across months (Fig 13). There was also no difference on the mean MeanLength of skipjack and yellowfin across month, except in bigeye where mean MeanLength in August was smaller (29 cm) than the previous month of July (33 cm).

In the Pacific, higher mean total catch was realized in September (12 t/set) compared to July (5.86 t/set) and August (5.93 t/set). There was no significant difference on the mean catch of SKJ, while an increasing trend of mean YFT catch from July to September. There was no difference on the catch of bigeye as well as on mean MeanLength of tuna species across the 3 month period in the Pacific.

The details of post hoc/LSD test by month (MONTH) are presented in Appendix 5.

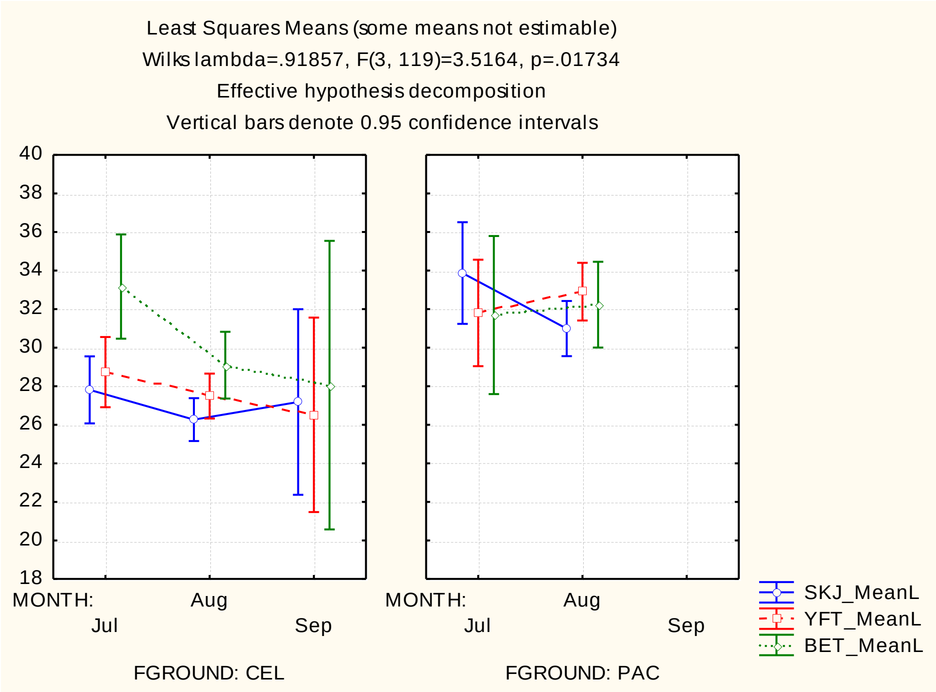


Figure 13. Mean MeanLength by species by MONTH and FGROUND

V. CONCLUSIONS

The FADs closure and the resulting implementation of FAO 236 that required deployment of Fisheries Observers onboard provided the opportunity to collect information as foundation to the current measures and its succeeding improvement. Information on catch, species, size composition and their variations according to fishing ground, fishing grid, depth of nets and season (month) can be drawn to devise technical and related measures that include areal/seasonal controls as well as gear and operational regulations.

The study supports FAO 236 that reduction of net depths decreases catch of BET. Continuation of the Observer Program and supplementary observations could further improve and confirm these findings and substantiate measure on the amount of reduction. It is however important to take into consideration that reduction of depth may not only decrease catch of BET and YFT but also SKJ that may impact on the economics of operations. In addition, the validation that larger mean size of fish is caught in deeper nets is important for future technical measures.

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The result suggests that BET catch are not different across fishing grounds especially in the Pacific and Celebes. This leaves out possible measures that take into account areal control or restriction mechanisms by fishing ground. However, the indication of relatively higher catch for BET in grid P3 in the East of Surigao & Eastern Samar should be considered when investigating further reduction of BET.

Celebes Sea is the most important fishing ground for mackerel scad and skipjack tuna, however it is also the fishing ground where smallest size skipjack and yellowfin are caught.

Decreasing catches have become more apparent and becoming more obvious that current level of fishing is unsustainable. This situation of the fishery should be addressed only through rational management of fishing effort. The implementation of FAO 236 provides a system of enhanced monitoring and enforcement which can be sustained and demonstrated to be workable and should be used as a platform to instigate practicable measures.

The implementation of Observer Program is also considered as a tangible step towards fostering collaboration/cooperation between BFAR as the Resource Manager and Boat Operators, Officers and Crew as Resource Users. The learning/awareness building process of both parties during the course of the FOP implementation will contribute to improved application and adherence to policies.

With the above, it is recommended that FAO 236 should be extended and transformed/enhanced as a regular regulation with the following considerations:

1. **Expand FOP**. Each registered vessel accommodates an Observer for 20-days every semester (6 months) at their own expense; additional deployment will be at the expense of BFAR.

2. **Create a BFAR-INDUSTRY Operational Body**. Working groups that are participatory in nature should be organized to steer, manage and monitor implementation. Regular conduct of consultations and reporting systems also enhance awareness and cooperation building between concerned parties.

3. **Enhance/strengthen patrol and enforcement**. This is a form of pseudo-catch effort reduction that deters operations of unregistered and non-compliant vessels and simultaneously gives the incentive to compliant vessels to participate and cooperate.

4. **Incorporate regulation on the maximum number of payao per catcher vessel**

5. **Include mesh size studies.** It is unfortunate that the covered fleet are not compliant to existing mesh regulation which did not afford to validate the importance of the mesh regulation.

Lastly, species-specific management plan of tuna species (e.g. skipjack, yellowfin, and bigeye) & small pelagics (round scads, frigate & bullet tunas, bigeye scad) should be formulated that take into consideration technical measures such as area/time and gear (depth/length/mesh) restrictions as well as rational capacity reduction strategy including reduction by attrition and other measures.

VI. REFERENCES

Babaran, R.P. Payao fishing and its impact to tuna stocks: A preliminary analysis. WCPFC-SC2-2006/FT WP-7.

BFAR. Philippine Fisheries Profile 2008.

Dela Cruz, W. 2010. Observer Trip Report. BFAR, NMFDC.

Mindanao Development Authority. Results of the data collection-Validation on the catch of fishing vessels using ringnets.

STATISCA ver 7. StatSoft, Inc.

VII. APPENDICES

(PLEASE SEE ATTACHED pdf files)

Cell No.	LSD test; variable TOTAL (FGROUND_All.sta) Probabilities for Post Hoc Tests Error: Between MS = 26.211, df = 427.00 FGROUND	{1} 7.1194	{2} 6.2122	{3} 11.627	{4} 11.250
1	CEL		0.103800	0.000958	0.109736
2	PAC	0.103800		0.000131	0.053556
3	WPS	0.000958	0.000131		0.896041
4	SS	0.109736	0.053556	0.896041	

Cell No.	LSD test; variable SKJ (FGROUND_All.sta) Probabilities for Post Hoc Tests Error: Between MS = 8.9746, df = 427.00 FGROUND	{1} 2.5910	{2} 2.7290	{3} 9.7322	{4} 6.9990
1	CEL		0.671927	0.000000	0.003652
2	PAC	0.671927		0.000000	0.005278
3	WPS	0.000000	0.000000		0.105691
4	SS	0.003652	0.005278	0.105691	

Cell No.	LSD test; variable YFT (FGROUND_All.sta) Probabilities for Post Hoc Tests Error: Between MS = 1.3613, df = 427.00 FGROUND	{1} 1.0399	{2} 1.5329	{3} .79593	{4} 2.9782
1	CEL		0.000117	0.430076	0.001047
2	PAC	0.000117		0.021622	0.015223
3	WPS	0.430076	0.021622		0.000965
4	SS	0.001047	0.015223	0.000965	

Cell No.	LSD test; variable BET (FGROUND_All.sta) Probabilities for Post Hoc Tests Error: Between MS = .31740, df = 427.00 FGROUND	{1} .14773	{2} .17700	{3} .29083	{4} 0.0000
1	CEL		0.632895	0.337856	0.602712
2	PAC	0.632895		0.461281	0.536869
3	WPS	0.337856	0.461281		0.359480
4	SS	0.602712	0.536869	0.359480	

Cell No.	LSD test; variable MSD (FGROUND_All.sta) Probabilities for Post Hoc Tests Error: Between MS = 2.7292, df = 427.00 FGROUND	{1} 1.8728	{2} 1.1256	{3} .02315	{4} .24985
1	CEL		0.000038	0.000029	0.051651
2	PAC	0.000038		0.015272	0.297599
3	WPS	0.000029	0.015272		0.807461
4	SS	0.051651	0.297599	0.807461	

Cell No.	LSD test; variable SKJ_MeanL (FGROUND_All.sta) Probabilities for Post Hoc Tests Error: Between MS = 16.784, df = 404.00 FGROUND	{1} 26.109	{2} 30.426	{3} 39.598	{4} 38.277
1	CEL		0.000000	0.000000	0.000000
2	PAC	0.000000		0.000000	0.000192
3	WPS	0.000000	0.000000		0.566909
4	SS	0.000000	0.000192	0.566909	

Cell No.	LSD test; variable YFT_MeanL (FGROUND_All.sta) Probabilities for Post Hoc Tests Error: Between MS = 27.307, df = 378.00 FGROUND	{1} 27.335	{2} 31.263	{3} 39.087	{4} 48.852
1	CEL		0.000000	0.000000	0.000000
2	PAC	0.000000		0.000000	0.000000
3	WPS	0.000000	0.000000		0.003516
4	SS	0.000000	0.000000	0.003516	

Cell No.	FGRID	{1} 9.7065	{2} 7.7867	{3} 6.9433	{4} 4.1329	{5} 5.6321	{6} 5.1081	{7} 4.4795	{8} 8.7174	{9} 7.7304	{10} 11.627	{11} 11.250
	LSD test; variable TOTAL (FGROUND_All.sta) Probabilities for Post Hoc Tests Error: Between MS = 23.817, df = 420.00											
1	C1		0.023892	0.001900	0.000000	0.000006	0.000001	0.000058	0.410135	0.100270	0.174343	0.540771
2	C2	0.023892		0.311003	0.000320	0.010566	0.002178	0.008547	0.423407	0.961356	0.005596	0.167288
3	C3	0.001900	0.311003		0.007085	0.135485	0.043215	0.054417	0.136403	0.508299	0.000912	0.087734
4	C4	0.000000	0.000320	0.007085		0.151931	0.361926	0.804331	0.000555	0.006592	0.000001	0.006053
5	C5	0.000006	0.010566	0.135485	0.151931		0.565807	0.369171	0.010112	0.079615	0.000025	0.026253
6	P1	0.000001	0.002178	0.043215	0.361926	0.565807		0.629417	0.003146	0.031489	0.000006	0.015571
7	P2	0.000058	0.008547	0.054417	0.804331	0.369171	0.629417		0.005328	0.032225	0.000027	0.012042
8	P3	0.410135	0.423407	0.136403	0.000555	0.010112	0.003146	0.005328		0.493209	0.073176	0.338643
9	P4	0.100270	0.961356	0.508299	0.006592	0.079615	0.031489	0.032225	0.493209		0.016578	0.183828
10	WPS	0.174343	0.005596	0.000912	0.000001	0.000025	0.000006	0.000027	0.073176	0.016578		0.890973
11	SS	0.540771	0.167288	0.087734	0.006053	0.026253	0.015571	0.012042	0.338643	0.183828	0.890973	

Cell No.	FGRID	{1} 4.1285	{2} 2.5719	{3} 2.3508	{4} 1.5181	{5} 1.9736	{6} 2.0129	{7} 1.6883	{8} 4.6584	{9} 3.3404	{10} 9.7322	{11} 6.9990
	LSD test; variable SKJ (FGROUND_All.sta) Probabilities for Post Hoc Tests Error: Between MS = 8.2956, df = 420.00											
1	C1		0.001968	0.000721	0.000031	0.000050	0.000112	0.001421	0.454608	0.266304	0.000000	0.054412
2	C2	0.001968		0.652549	0.076894	0.227593	0.276119	0.232371	0.002481	0.262860	0.000000	0.002895
3	C3	0.000721	0.652549		0.174991	0.466388	0.527326	0.380033	0.001091	0.159185	0.000000	0.001871
4	C4	0.000031	0.076894	0.174991		0.460309	0.433052	0.836580	0.000064	0.019569	0.000000	0.000356
5	C5	0.000050	0.227593	0.466388	0.460309		0.941857	0.706367	0.000160	0.053125	0.000000	0.000791
6	P1	0.000112	0.276119	0.527326	0.433052	0.941857		0.672917	0.000255	0.064860	0.000000	0.000910
7	P2	0.001421	0.232371	0.380033	0.836580	0.706367	0.672917		0.000958	0.064989	0.000000	0.000876
8	P3	0.454608	0.002481	0.001091	0.000064	0.000160	0.000255	0.000958		0.121460	0.000000	0.134347
9	P4	0.266304	0.262860	0.159185	0.019569	0.053125	0.064860	0.064989	0.121460		0.000000	0.019503
10	WPS	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000		0.092471
11	SS	0.054412	0.002895	0.001871	0.000356	0.000791	0.000910	0.000876	0.134347	0.019503	0.092471	

LSD test; variable YFT (FGROUND_All.sta)
Probabilities for Post Hoc Tests
Error: Between MS = 1.2840, df = 420.00

Cell No.	FGRID	{1} 1.0778	{2} 1.0631	{3} 1.2633	{4} .84357	{5} .85297	{6} 1.1901	{7} .87920	{8} 2.1946	{9} 2.2160	{10} .79593	{11} 2.9782
1	C1		0.940552	0.366631	0.337670	0.277898	0.598810	0.506844	0.000072	0.000052	0.390205	0.001264
2	C2	0.940552		0.300345	0.348295	0.281326	0.529116	0.527259	0.000033	0.000024	0.404476	0.001069
3	C3	0.366631	0.300345		0.082478	0.044441	0.727842	0.195993	0.000811	0.000614	0.151848	0.003518
4	C4	0.337670	0.348295	0.082478		0.969125	0.163167	0.912653	0.000013	0.000009	0.892171	0.000407
5	C5	0.277898	0.281326	0.044441	0.969125		0.112036	0.929829	0.000002	0.000001	0.861444	0.000314
6	P1	0.598810	0.529116	0.727842	0.163167	0.112036		0.304213	0.000413	0.000311	0.233969	0.002472
7	P2	0.506844	0.527259	0.195993	0.912653	0.929829	0.304213		0.000206	0.000163	0.831627	0.000829
8	P3	0.000072	0.000033	0.000811	0.000013	0.000002	0.000413	0.000206		0.948812	0.000227	0.202479
9	P4	0.000052	0.000024	0.000614	0.000009	0.000001	0.000311	0.000163	0.948812		0.000182	0.215096
10	WPS	0.390205	0.404476	0.151848	0.892171	0.861444	0.233969	0.831627	0.000227	0.000182		0.000682
11	SS	0.001264	0.001069	0.003518	0.000407	0.000314	0.002472	0.000829	0.202479	0.215096	0.000682	

LSD test; variable BET (FGROUND_All.sta)
Probabilities for Post Hoc Tests
Error: Between MS = .31274, df = 420.00

Cell No.	FGRID	{1} .23241	{2} .20831	{3} .09873	{4} .05340	{5} .09353	{6} .07757	{7} .14072	{8} .48840	{9} .12902	{10} .29083	{11} 0.0000
1	C1		0.803935	0.187749	0.137850	0.174555	0.142266	0.534547	0.063283	0.452427	0.718096	0.421647
2	C2	0.803935		0.250820	0.180141	0.233197	0.189740	0.637740	0.035923	0.551682	0.601746	0.468179
3	C3	0.187749	0.250820		0.703428	0.958729	0.838429	0.774386	0.004446	0.824174	0.232522	0.732223
4	C4	0.137850	0.180141	0.703428		0.737545	0.843558	0.585958	0.004165	0.616713	0.171507	0.856743
5	C5	0.174555	0.233197	0.958729	0.737545		0.878689	0.748260	0.004107	0.795482	0.221587	0.746067
6	P1	0.142266	0.189740	0.838429	0.843558	0.878689		0.672297	0.003351	0.711952	0.192083	0.789071
7	P2	0.534547	0.637740	0.774386	0.585958	0.748260	0.672297		0.045559	0.946255	0.437508	0.647623
8	P3	0.063283	0.035923	0.004446	0.004165	0.004107	0.003351	0.045559		0.029868	0.287711	0.107690
9	P4	0.452427	0.551682	0.824174	0.616713	0.795482	0.711952	0.946255	0.029868		0.383814	0.670417
10	WPS	0.718096	0.601746	0.232522	0.171507	0.221587	0.192083	0.437508	0.287711	0.383814		0.355940
11	SS	0.421647	0.468179	0.732223	0.856743	0.746067	0.789071	0.647623	0.107690	0.670417	0.355940	

Cell No.	FGRID	{1} 2.2129	{2} 2.1355	{3} 1.7301	{4} 1.1564	{5} 1.7631	{6} 1.0650	{7} 1.1591	{8} 1.0966	{9} 1.2694	{10} .02315	{11} .24985
	LSD test; variable MSD (FGROUND_All.sta) Probabilities for Post Hoc Tests Error: Between MS = 2.6979, df = 420.00											
1	C1		0.786073	0.105437	0.002980	0.134376	0.000234	0.015422	0.005946	0.019918	0.000005	0.021194
2	C2	0.786073		0.148177	0.004064	0.187838	0.000282	0.020949	0.008164	0.027244	0.000007	0.025749
3	C3	0.105437	0.148177		0.101503	0.911125	0.029548	0.184840	0.114137	0.250260	0.000334	0.081233
4	C4	0.002980	0.004064	0.101503		0.085156	0.799345	0.995481	0.892699	0.799066	0.026547	0.296997
5	C5	0.134376	0.187838	0.911125	0.085156		0.023434	0.162394	0.098012	0.220027	0.000268	0.074992
6	P1	0.000234	0.000282	0.029548	0.799345	0.023434		0.829988	0.938424	0.617452	0.030322	0.338766
7	P2	0.015422	0.020949	0.184840	0.995481	0.162394	0.829988		0.902342	0.828634	0.045892	0.314858
8	P3	0.005946	0.008164	0.114137	0.892699	0.098012	0.938424	0.902342		0.721435	0.049590	0.341850
9	P4	0.019918	0.027244	0.250260	0.799066	0.220027	0.617452	0.828634	0.721435		0.022741	0.252529
10	WPS	0.000005	0.000007	0.000334	0.026547	0.000268	0.030322	0.045892	0.049590	0.022741		0.806372
11	SS	0.021194	0.025749	0.081233	0.296997	0.074992	0.338766	0.314858	0.341850	0.252529	0.806372	

Cell No.	FGRID	{1} 25.885	{2} 27.420	{3} 26.409	{4} 24.643	{5} 25.166	{6} 29.304	{7} 30.337	{8} 31.872	{9} 31.871	{10} 39.598	{11} 38.277
	LSD test; variable SKJ_MeanL (FGROUND_All.sta) Probabilities for Post Hoc Tests Error: Between MS = 16.074, df = 397.00											
1	C1		0.029812	0.472939	0.151171	0.344207	0.000012	0.000032	0.000000	0.000000	0.000000	0.000000
2	C2	0.029812		0.146212	0.000956	0.002033	0.011059	0.005029	0.000005	0.000047	0.000000	0.000000
3	C3	0.472939	0.146212		0.039731	0.098417	0.000168	0.000214	0.000000	0.000001	0.000000	0.000000
4	C4	0.151171	0.000956	0.039731		0.553098	0.000000	0.000001	0.000000	0.000000	0.000000	0.000000
5	C5	0.344207	0.002033	0.098417	0.553098		0.000000	0.000002	0.000000	0.000000	0.000000	0.000000
6	P1	0.000012	0.011059	0.000168	0.000000	0.000000		0.339693	0.011385	0.023131	0.000000	0.000021
7	P2	0.000032	0.005029	0.000214	0.000001	0.000002	0.339693		0.217450	0.252564	0.000000	0.000358
8	P3	0.000000	0.000005	0.000000	0.000000	0.000000	0.011385	0.217450		0.998918	0.000000	0.003378
9	P4	0.000000	0.000047	0.000001	0.000000	0.000000	0.023131	0.252564	0.998918		0.000000	0.004252
10	WPS	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000		0.558484
11	SS	0.000000	0.000000	0.000000	0.000000	0.000000	0.000021	0.000358	0.003378	0.004252	0.558484	

LSD test; variable YFT_MeanL (FGROUND_All.sta)
Probabilities for Post Hoc Tests
Error: Between MS = 26.430, df = 371.00

Cell No.	FGRID	{1} 26.749	{2} 28.759	{3} 26.677	{4} 25.978	{5} 28.039	{6} 29.561	{7} 32.402	{8} 32.551	{9} 33.252	{10} 39.087	{11} 48.852
1	C1		0.037625	0.940630	0.494917	0.185625	0.004671	0.000038	0.000006	0.000006	0.000000	0.000000
2	C2	0.037625		0.032828	0.015425	0.467187	0.425096	0.008078	0.003168	0.001770	0.000000	0.000000
3	C3	0.940630	0.032828		0.538044	0.166044	0.004017	0.000033	0.000005	0.000005	0.000000	0.000000
4	C4	0.494917	0.015425	0.538044		0.074105	0.002230	0.000020	0.000004	0.000003	0.000000	0.000000
5	C5	0.185625	0.467187	0.166044	0.074105		0.133948	0.001628	0.000494	0.000314	0.000000	0.000000
6	P1	0.004671	0.425096	0.004017	0.002230	0.133948		0.040999	0.021537	0.010960	0.000000	0.000000
7	P2	0.000038	0.008078	0.000033	0.000020	0.001628	0.040999		0.925818	0.621046	0.000256	0.000000
8	P3	0.000006	0.003168	0.000005	0.000004	0.000494	0.021537	0.925818		0.670255	0.000204	0.000000
9	P4	0.000006	0.001770	0.000005	0.000003	0.000314	0.010960	0.621046	0.670255		0.001793	0.000002
10	WPS	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000256	0.000204	0.001793		0.003020
11	SS	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000002	0.003020	

FGROUND NDEPTH1	LSD Test; Variable: TOTAL (CEL&PAC_All.sta) Marked differences are significant at p < .05000					
	{1} M=6.4340	{2} M=7.8782	{3} M=5.6839	{4} M=6.6616	{5} M=4.9365	{6} M=0.0000
CEL 101-120 {1}		0.017648	0.505798	0.743602	0.133893	
CEL 81-100 {2}	0.017648		0.048090	0.067294	0.002712	
CEL 61-80 {3}	0.505798	0.048090		0.399017	0.583117	
PAC 101-120 {4}	0.743602	0.067294	0.399017		0.095610	
PAC 81-100 {5}	0.133893	0.002712	0.583117	0.095610		
PAC 61-80 {6}						

FGROUND NDEPTH1	LSD Test; Variable: YFT (CEL&PAC_All.sta) Marked differences are significant at p < .05000					
	{1} M=.78178	{2} M=1.3243	{3} M=.57978	{4} M=1.6152	{5} M=1.2994	{6} M=0.0000
CEL 101-120 {1}		0.000099	0.431323	0.000000	0.023123	
CEL 81-100 {2}	0.000099		0.003314	0.054757	0.910754	
CEL 61-80 {3}	0.431323	0.003314		0.000101	0.020694	
PAC 101-120 {4}	0.000000	0.054757	0.000101		0.180072	
PAC 81-100 {5}	0.023123	0.910754	0.020694	0.180072		
PAC 61-80 {6}						

FGROUND NDEPTH1	LSD Test; Variable: MSD (CEL&PAC_All.sta) Marked differences are significant at p < .05000					
	{1} M=1.6594	{2} M=1.9811	{3} M=2.2794	{4} M=1.1650	{5} M=1.0138	{6} M=0.0000
CEL 101-120 {1}		0.119639	0.106536	0.037271	0.057800	
CEL 81-100 {2}	0.119639		0.428851	0.000337	0.003751	
CEL 61-80 {3}	0.106536	0.428851		0.004918	0.006553	
PAC 101-120 {4}	0.037271	0.000337	0.004918		0.667256	
PAC 81-100 {5}	0.057800	0.003751	0.006553	0.667256		
PAC 61-80 {6}						

FGROUND NDEPTH1	LSD Test; Variable: YFT_MeanL (CEL&PAC_All.sta) Marked differences are significant at p < .05000					
	{1} M=28.187	{2} M=27.006	{3} M=25.901	{4} M=31.404	{5} M=30.892	{6} M=0.0000
CEL 101-120 {1}		0.086832	0.061673	0.000055	0.012701	
CEL 81-100 {2}	0.086832		0.348537	0.000000	0.000195	
CEL 61-80 {3}	0.061673	0.348537		0.000012	0.000603	
PAC 101-120 {4}	0.000055	0.000000	0.000012		0.642405	
PAC 81-100 {5}	0.012701	0.000195	0.000603	0.642405		
PAC 61-80 {6}						

FGROUND	NDEPTH1	LSD Test; Variable: SKJ (CEL&PAC_All.sta) Marked differences are significant at p < .05000 {1} M=2.3070	{2} M=2.9353	{3} M=2.0202	{4} M=3.1007	{5} M=1.6738	{6} M=0.0000
CEL	101-120 {1}		0.059426	0.642544	0.037963	0.247434	
CEL	81-100 {2}	0.059426		0.132357	0.649413	0.018764	
CEL	61-80 {3}	0.642544	0.132357		0.089563	0.642721	
PAC	101-120 {4}	0.037963	0.649413	0.089563		0.012123	
PAC	81-100 {5}	0.247434	0.018764	0.642721	0.012123		
PAC	61-80 {6}						

FGROUND	NDEPTH1	LSD Test; Variable: BET (CEL&PAC_All.sta) Marked differences are significant at p < .05000 {1} M=.18027	{2} M=.14944	{3} M=.02519	{4} M=.20929	{5} M=.08534	{6} M=0.0000
CEL	101-120 {1}		0.663308	0.238915	0.720786	0.415267	
CEL	81-100 {2}	0.663308		0.336812	0.439882	0.573662	
CEL	61-80 {3}	0.238915	0.336812		0.173988	0.705149	
PAC	101-120 {4}	0.720786	0.439882	0.173988		0.304515	
PAC	81-100 {5}	0.415267	0.573662	0.705149	0.304515		
PAC	61-80 {6}						

FGROUND	NDEPTH1	LSD Test; Variable: SKJ_MeanL (CEL&PAC_All.sta) Marked differences are significant at p < .05000 {1} M=27.650	{2} M=25.050	{3} M=24.934	{4} M=30.374	{5} M=30.578	{6} M=0.0000
CEL	101-120 {1}		0.000000	0.003866	0.000004	0.000602	
CEL	81-100 {2}	0.000000		0.900229	0.000000	0.000000	
CEL	61-80 {3}	0.003866	0.900229		0.000000	0.000001	
PAC	101-120 {4}	0.000004	0.000000	0.000000		0.816980	
PAC	81-100 {5}	0.000602	0.000000	0.000001	0.816980		
PAC	61-80 {6}						

FGROUND	NDEPTH1	LSD Test; Variable: BET_MeanL (CEL&PAC_All.sta) Marked differences are significant at p < .05000 {1} M=29.948	{2} M=32.047	{3} M=25.386	{4} M=31.729	{5} M=33.399	{6} M=0.0000
CEL	101-120 {1}		0.143263	0.083497	0.221360	0.126991	
CEL	81-100 {2}	0.143263		0.013875	0.837179	0.559381	
CEL	61-80 {3}	0.083497	0.013875		0.019569	0.013111	
PAC	101-120 {4}	0.221360	0.837179	0.019569		0.473770	
PAC	81-100 {5}	0.126991	0.559381	0.013111	0.473770		
PAC	61-80 {6}						

FGROUND	GTYPE		LSD Test; Variable: TOTAL (CEL&PAC_All.sta) Marked differences are significant at p < .05000 {1} M=10.360	{2} M=6.5160	{3} M=5.0322	{4} M=8.0847
CEL	PS	{1}		0.000001	0.000000	0.023358
CEL	RN	{2}	0.000001		0.020636	0.042188
PAC	PS	{3}	0.000000	0.020636		0.000786
PAC	RN	{4}	0.023358	0.042188	0.000786	

FGROUND	GTYPE		LSD Test; Variable: SKJ (CEL&PAC_All.sta) Marked differences are significant at p < .05000 {1} M=4.2212	{2} M=2.3079	{3} M=2.1625	{4} M=3.6279
CEL	PS	{1}		0.000009	0.000045	0.284053
CEL	RN	{2}	0.000009		0.680914	0.002076
PAC	PS	{3}	0.000045	0.680914		0.003525
PAC	RN	{4}	0.284053	0.002076	0.003525	

FGROUND	GTYPE		LSD Test; Variable: YFT (CEL&PAC_All.sta) Marked differences are significant at p < .05000 {1} M=1.0705	{2} M=1.0409	{3} M=1.0416	{4} M=2.3125
CEL	PS	{1}		0.867272	0.889617	0.000000
CEL	RN	{2}	0.867272		0.995741	0.000000
PAC	PS	{3}	0.889617	0.995741		0.000000
PAC	RN	{4}	0.000000	0.000000	0.000000	

FGROUND	GTYPE		LSD Test; Variable: BET (CEL&PAC_All.sta) Marked differences are significant at p < .05000 {1} M=.30023	{2} M=.12464	{3} M=.25723	{4} M=.04969
CEL	PS	{1}		0.057126	0.690456	0.036665
CEL	RN	{2}	0.057126		0.083229	0.415939
PAC	PS	{3}	0.690456	0.083229		0.055109
PAC	RN	{4}	0.036665	0.415939	0.055109	

			LSD Test; Variable: MSD (CEL&PAC_All.sta) Marked differences are significant at p < .05000			
			{1}	{2}	{3}	{4}
FGROUND	GTYPE		M=2.5709	M=1.7440	M=.91061	M=1.4669
CEL	PS	{1}		0.002099	0.000000	0.001568
CEL	RN	{2}	0.002099		0.000194	0.300017
PAC	PS	{3}	0.000000	0.000194		0.076386
PAC	RN	{4}	0.001568	0.300017	0.076386	

			LSD Test; Variable: SKJ_MeanL (CEL&PAC_All.sta) Marked differences are significant at p < .05000			
			{1}	{2}	{3}	{4}
FGROUND	GTYPE		M=25.890	M=26.152	M=30.426	M=30.427
CEL	PS	{1}		0.695993	0.000000	0.000000
CEL	RN	{2}	0.695993		0.000000	0.000000
PAC	PS	{3}	0.000000	0.000000		0.999751
PAC	RN	{4}	0.000000	0.000000	0.999751	

			LSD Test; Variable: YFT_MeanL (CEL&PAC_All.sta) Marked differences are significant at p < .05000			
			{1}	{2}	{3}	{4}
FGROUND	GTYPE		M=25.816	M=27.668	M=31.159	M=31.405
CEL	PS	{1}		0.027175	0.000000	0.000000
CEL	RN	{2}	0.027175		0.000003	0.000010
PAC	PS	{3}	0.000000	0.000003		0.804678
PAC	RN	{4}	0.000000	0.000010	0.804678	

			LSD Test; Variable: BET_MeanL (CEL&PAC_All.sta) Marked differences are significant at p < .05000			
			{1}	{2}	{3}	{4}
FGROUND	GTYPE		M=28.169	M=31.283	M=31.359	M=35.479
CEL	PS	{1}		0.041870	0.059720	0.006065
CEL	RN	{2}	0.041870		0.954363	0.084612
PAC	PS	{3}	0.059720	0.954363		0.104668
PAC	RN	{4}	0.006065	0.084612	0.104668	

FGROUND	MONTH		LSD Test; Variable: TOTAL (CEL&PAC_All.sta) Marked differences are significant at p < .05000					
			{1} M=7.7620	{2} M=7.0058	{3} M=3.7800	{4} M=5.8600	{5} M=5.9314	{6} M=12.000
CEL	Jul	{1}		0.211394	0.003429	0.033726	0.015087	0.040201
CEL	Aug	{2}	0.211394		0.015128	0.176301	0.122167	0.014742
CEL	Sep	{3}	0.003429	0.015128		0.159707	0.123801	0.000584
PAC	Jul	{4}	0.033726	0.176301	0.159707		0.940505	0.004375
PAC	Aug	{5}	0.015087	0.122167	0.123801	0.940505		0.003840
PAC	Sep	{6}	0.040201	0.014742	0.000584	0.004375	0.003840	

FGROUND	MONTH		LSD Test; Variable: YFT (CEL&PAC_All.sta) Marked differences are significant at p < .05000					
			{1} M=1.1687	{2} M=.99646	{3} M=.71448	{4} M=1.0361	{5} M=1.7135	{6} M=2.8737
CEL	Jul	{1}		0.215047	0.144447	0.518185	0.001681	0.000350
CEL	Aug	{2}	0.215047		0.353646	0.838258	0.000009	0.000073
CEL	Sep	{3}	0.144447	0.353646		0.343418	0.001949	0.000087
PAC	Jul	{4}	0.518185	0.838258	0.343418		0.002165	0.000215
PAC	Aug	{5}	0.001681	0.000009	0.001949	0.002165		0.015932
PAC	Sep	{6}	0.000350	0.000073	0.000087	0.000215	0.015932	

FGROUND	MONTH		LSD Test; Variable: MSD (CEL&PAC_All.sta) Marked differences are significant at p < .05000					
			{1} M=1.9332	{2} M=1.9565	{3} M=.50966	{4} M=1.0922	{5} M=.99257	{6} M=2.9343
CEL	Jul	{1}		0.909182	0.001941	0.005475	0.000229	0.150301
CEL	Aug	{2}	0.909182		0.001279	0.002613	0.000046	0.155964
CEL	Sep	{3}	0.001941	0.001279		0.242946	0.305452	0.002594
PAC	Jul	{4}	0.005475	0.002613	0.242946		0.757493	0.011181
PAC	Aug	{5}	0.000229	0.000046	0.305452	0.757493		0.006082
PAC	Sep	{6}	0.150301	0.155964	0.002594	0.011181	0.006082	

FGROUND	MONTH		LSD Test; Variable: YFT_MeanL (CEL&PAC_All.sta) Marked differences are significant at p < .05000					
			{1} M=28.428	{2} M=26.694	{3} M=27.336	{4} M=29.442	{5} M=32.053	{6} M=32.056
CEL	Jul	{1}		0.010330	0.520359	0.327569	0.000010	0.091700
CEL	Aug	{2}	0.010330		0.699302	0.005145	0.000000	0.011788
CEL	Sep	{3}	0.520359	0.699302		0.252681	0.006435	0.073440
PAC	Jul	{4}	0.327569	0.005145	0.252681		0.015613	0.247997
PAC	Aug	{5}	0.000010	0.000000	0.006435	0.015613		0.998987
PAC	Sep	{6}	0.091700	0.011788	0.073440	0.247997	0.998987	

			LSD Test; Variable: SKJ (CEL&PAC_All.sta) Marked differences are significant at p < .05000					
FGROUND	MONTH		{1} M=2.5592	{2} M=2.6976	{3} M=1.9498	{4} M=2.6879	{5} M=2.5924	{6} M=4.6331
CEL	Jul	{1}		0.681512	0.419541	0.796194	0.936880	0.071592
CEL	Aug	{2}	0.681512		0.311064	0.983625	0.785787	0.089454
CEL	Sep	{3}	0.419541	0.311064		0.370535	0.409215	0.043061
PAC	Jul	{4}	0.796194	0.983625	0.370535		0.857842	0.104221
PAC	Aug	{5}	0.936880	0.785787	0.409215	0.857842		0.080240
PAC	Sep	{6}	0.071592	0.089454	0.043061	0.104221	0.080240	

			LSD Test; Variable: BET (CEL&PAC_All.sta) Marked differences are significant at p < .05000					
FGROUND	MONTH		{1} M=.24900	{2} M=.10092	{3} M=.03652	{4} M=.12461	{5} M=.22295	{6} M=0.0000
CEL	Jul	{1}		0.037039	0.180806	0.235062	0.767047	0.302648
CEL	Aug	{2}	0.037039		0.677921	0.811151	0.134021	0.672992
CEL	Sep	{3}	0.180806	0.677921		0.610940	0.254739	0.895481
PAC	Jul	{4}	0.235062	0.811151	0.610940		0.380339	0.619892
PAC	Aug	{5}	0.767047	0.134021	0.254739	0.380339		0.362478
PAC	Sep	{6}	0.302648	0.672992	0.895481	0.619892	0.362478	

			LSD Test; Variable: SKJ_MeanL (CEL&PAC_All.sta) Marked differences are significant at p < .05000					
FGROUND	MONTH		{1} M=26.314	{2} M=25.889	{3} M=27.162	{4} M=29.790	{5} M=30.590	{6} M=32.286
CEL	Jul	{1}		0.418509	0.461067	0.000025	0.000000	0.000681
CEL	Aug	{2}	0.418509		0.255773	0.000001	0.000000	0.000237
CEL	Sep	{3}	0.461067	0.255773		0.040782	0.003983	0.010932
PAC	Jul	{4}	0.000025	0.000001	0.040782		0.354252	0.173974
PAC	Aug	{5}	0.000000	0.000000	0.003983	0.354252		0.337600
PAC	Sep	{6}	0.000681	0.000237	0.010932	0.173974	0.337600	

			LSD Test; Variable: BET_MeanL (CEL&PAC_All.sta) Marked differences are significant at p < .05000					
FGROUND	MONTH		{1} M=33.170	{2} M=29.584	{3} M=28.864	{4} M=31.691	{5} M=32.231	{6} M=0.0000
CEL	Jul	{1}		0.026280	0.109216	0.549282	0.593794	
CEL	Aug	{2}	0.026280		0.769039	0.344877	0.060247	
CEL	Sep	{3}	0.109216	0.769039		0.361292	0.190056	
PAC	Jul	{4}	0.549282	0.344877	0.361292		0.817733	
PAC	Aug	{5}	0.593794	0.060247	0.190056	0.817733		
PAC	Sep	{6}						