

Ministry of Agriculture Fisheries Department

Seabob Catch per Unit Effort (CPUE) Annual Report 2016

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1.0 Acronyms

ATRP	Alternative Target Reference Point (TRP)
BEV	BEV Processors
BRD	By-Catch reduction device
CPUE	Catch per Unit Effort
CRFM	Caribbean Regional Fisheries Mechanism
CS	Closed Season
DAS	Days at Sea
ETP	Endangered, threatened and protected
FD	Fisheries Department
GATOSP	Guyana Association of Trawler Owners and Seafood Processors
GQS	Guyana Quality Seafoods
HCR	Harvest Control Rule
IUU	Illegal, Unreported and Unregulated
MOA	Ministry of Agriculture
MSC	Marine Stewardship Council Certification
MSY	Maximum Sustainable Yield
NHS	Noble House Seafoods
PSI	Pritipaul Singh Investment
SMP	Seabob Management Plan
SWG	Seabob Working Group
TAE	Total Allowable Effort
TED	Turtle Excluder Device
TRP	Target Reference Point (TRP)
TP	Trigger Point
LRP	Limit Reference Point
VMS	Vessel Monitoring System

2.0 Background

Guyana`s seabob stock was last assessed in June, 2013, where it was deemed fully exploited but not over fished. As a result of same, a proposed Harvest Control Rule (considered as `best practices` in fisheries management) was drafted following deliberations with the consultant, GATOSP and Fisheries Department. The current rule allows for 87 seabob vessel licenses each with an allocated 225 days at sea. This has since been implemented (2014), monitored and enforced by the key stakeholders, in particular the Fisheries Department through the Seabob Working Group (SWG). Consistent monitoring of vessel catch (Catch Per Unit Effort) and vessel movements while fishing (via Vessel Monitoring System) are currently being managed by Fisheries Department.

Guyana`s Seabob Fishery has been well known over the years for generating foreign exchange earnings and revenue through exports regionally and to markets in North America and Europe. The major industrial stakeholders include: Pritipaul Singh Investment (PSI), Noble House Seafoods (NHS), BEV Processors (BEV), Guyana Quality Seafoods (GQS), the Guyana Association of Trawler Owners and Seafood Processors (GATOSP), the Seabob Working Group (SWG) and the Fisheries Department (FD). The seabob stock was last `scientifically assessed` in June, 2013, where it was deemed fully exploited but not over fished. As a result of same, a proposed Harvest Control Rule (HCR) which is considered as `best practices` in fisheries management, was drafted following deliberations with the consultant, GATOSP and the FD. The current rule allows for an overall days-at-sea; 87 licenses each with an allocated 225 days at sea. The HCR has since been implemented (2014), monitored and enforced by the key stakeholders, particularly the FD and the SWG.

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4.0 Introduction

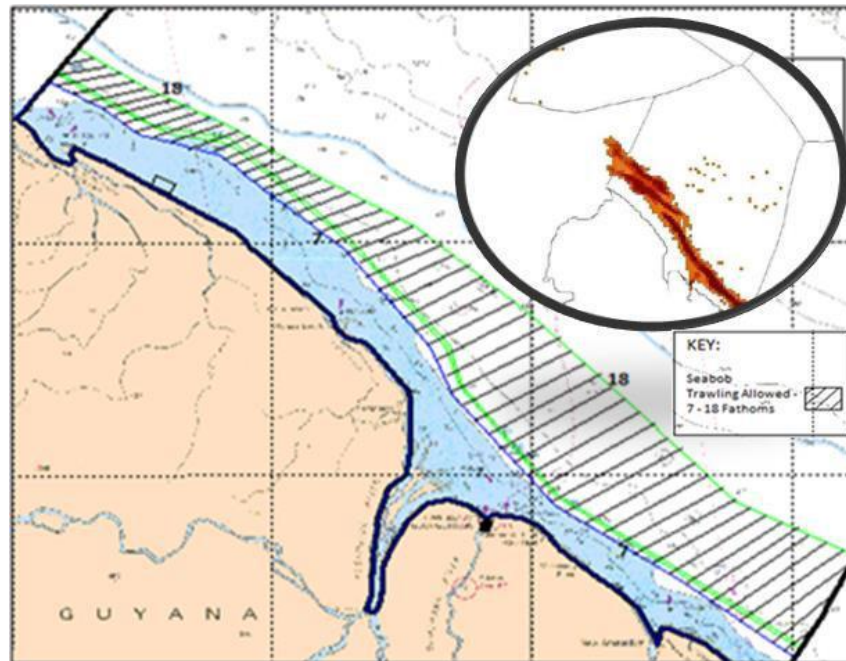
The Statistical Unit of the Fisheries Department, Ministry of Agriculture, is the unit responsible for the collection, compilation and analysis of seabob and other fisheries related data. The unit has developed its capacity over the years and is now more equipped to effectively carry out the aforesaid responsibilities. Seabob CPUE monitoring is one of such responsibility and has commenced in the year 2014. This task is routinely carried out by the Fisheries Department through the SWG; the body entrusted by the Minister with the responsibility of managing Guyana`s Seabob stock. The CPUE reports are generally presented and discussed at the SWG`s customary meetings (usually held the last Thursday of every month) following which they are shared with the relevant stakeholders. The reference points used were taken from the HCR and are used as primary indicators to assess catch rates (annually) and guide the requisite adjustments to DAS if needs be in order maintain the seabob stock above the MSY.

5.0 Species Description

The Atlantic seabob shrimp *Xiphopenaeus kroyeri* (Heller, 1862) (Crustacea: Penaeidea) is widely distributed along the coasts of the Western Atlantic Ocean, ranging from North Carolina (USA) to Santa Catarina State (South-Brazil) (Holthuis 1980). It is highly abundant in shallow waters (Holthuis 1980), making it easily accessible for coastal fisheries. Studies have found *X. kroyeri* to be a marine and brackish species, which occurs in depths reaching 70m, although it usually inhabits shallow waters less than 27m deep (Holthuis 1980). Juveniles prefer brackish waters, nursing in estuarine or inshore coastal waters. Adults move further offshore to spawn and planktonic larvae migrate back to the nursery grounds (Dall *et al.* 1990; Castro *et al.* 2005).

6.0 Fishing Ground

Image 1 - Map showing Guyana's trawling zone and the observed trawling intensity for 2016.



Highlights the total area fished for the year 2016. The colorations of red and orange are representative of Seabob trawling intensities, The Red areas represents “target ground” which presented the highest satellite pings. The top 75% of all trawling activities were carried out in the “red zones” (Mr. Amsterdam, 2016).

7.0 HCR Description

The HCR chosen by the industry (225pv_DaS) was consistent with attaining MSY and maintaining the stock above the limit reference point. For the HCR index, three reference points were proposed (Table 2). These were based around the observation that approximately 15000 standardized days-at-sea (approximately 20000 nominal days-at-sea) achieve an average SSB of 40% of the unexploited SSB, a proxy for B_{MSY} . The average catch rate at this level of depletion was 630kg processed tail weight per fishing day (Medley 2014).

Consultations with the industry suggested the lowest acceptable of 315kg processed tail weight per fishing day was an acceptable limit reference point (i.e. 50% B_{MSY}). That is, if catch rates fell to this level, a moratorium would be acceptable for economic reasons. Additionally, two trigger points were suggested. Firstly, the main trigger for stock rebuilding at 540kg per standardized day-at-sea, which is approximately 70% of the range between the limit and target reference points. Secondly, a reasonable catch rate based on economic considerations suggested by industry was approximately 600 kg per standardized boat day, a little below the target (Medley 2014).

Table 1 - HCR index reference points used in developing a precautionary HCR.

	Index Value (kilograms processed tail weight per standardised day at sea)
Target Reference Point (TRP)	600
Alternative TRP	630
Trigger Point	540
Limit Reference Point	315

8.0 Data Presentation and Analysis

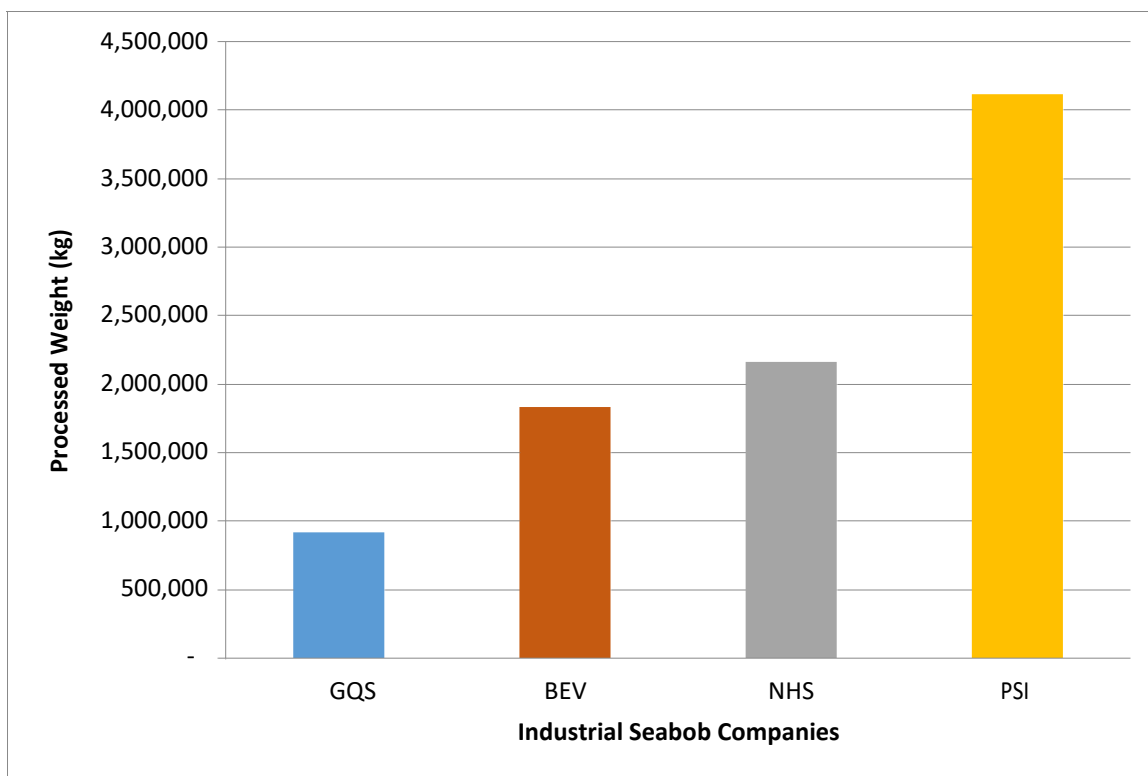
A total of eighty three (83) vessels operated in 2016, spending approximately thirteen thousand, nine hundred standardized days-at-sea (13,900 sdas). A sum of nine million, seventeen thousand and eighty seven kilograms (9,017,087 kgs) of seabob was processed after landing. The observed catch per unit effort (cpue) was six hundred and thirty four kilograms per standardized day-at-sea (649 kg/sdas). The Seabob vessels were permitted to operate between the 7 and 18 fathom lines which were established along Guyana's coastline within the Exclusive Economic Zone.

Table 2 - A summary of Guyana's industrial processed Seabob landings 2016.

INDUSTRIAL SEABOB CPUE 2016			
Months	Processed Weight (kgs)	Standardised Days-At-Sea (sdas)	Catch Per Unit Effort (CPUE)
January	803,686	1,271.701	632
February	819,181	1,227.501	667
March	841,685	1,340.453	628
April	792,992	1,320.159	601
May	924,283	1,343.116	688
June	1,191,261	1,413.530	843
July	939,055	1,440.383	652
August	673,770	1,451.908	464
September**	4,488	6.582	682
October**	57,215	86.828	659
November	976,634	1,465.595	666
December	992,836	1,531.837	648
	9,017,087	13,899.593	649

**Closed Season i.e. landings that overlapped in either early September or late October.

Figure 1 - A comparison of Guyana's Industrial Seabob Processed Landings 2016 by company.

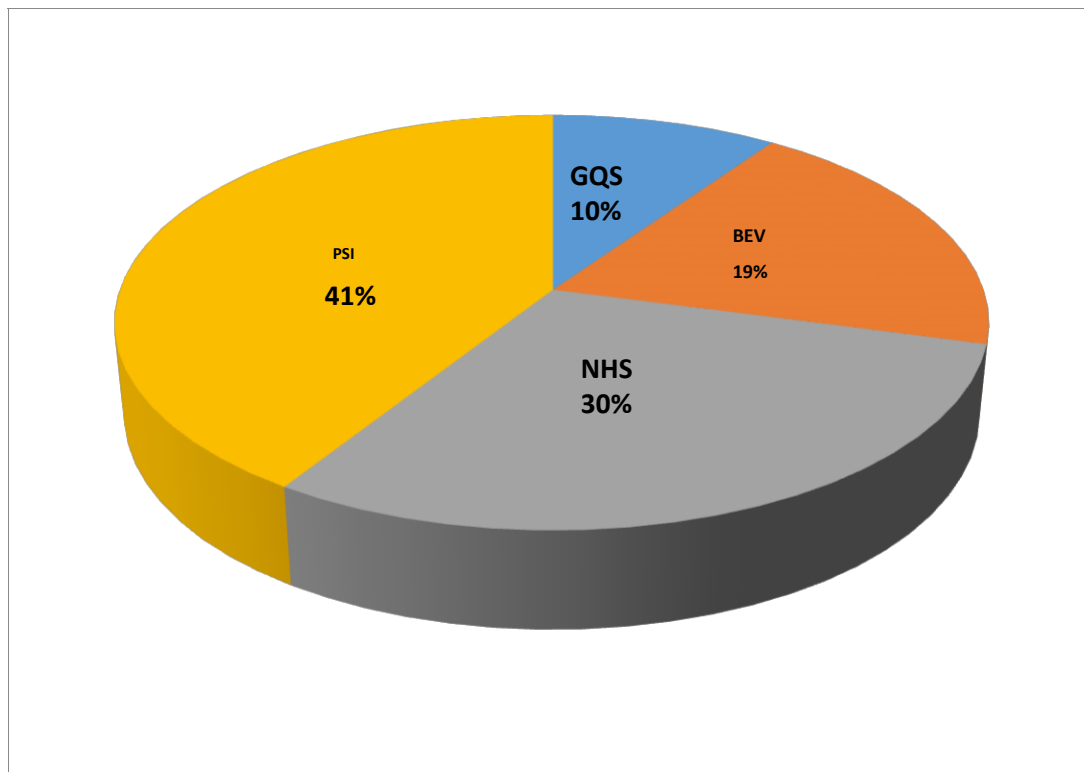


(Source: Seabob CPUE 2016 Data sheet.)

The graph above represents the total number of seabob processed after landing in kilograms by each of the industrial Seabob companies. From January to December 2016 a total of nine million, seventeen thousand and eighty seven kilograms (9,017,087 kgs) of seabob was processed after landing.

Pritipaul Singh Investments Inc. landed four million, one hundred and twelve thousand, seven hundred and eighty two kilograms (4,112,782 kgs) of that amount; this represents 46% (*the highest*) of the total weight. Noble House Seafoods Ltd. landed two million, one hundred and fifty eight thousand and sixty four kilograms (2,158,064 kgs), this translated to 24% (*the second highest*) of the total weight. BEV processors Inc. landed one million, eight hundred and thirty one thousand, nine hundred and sixty eight kilograms (1,831,968 kgs), representing 20% (*the penultimate lowest*) of the total weight and which happened to be lower than that of both PSI and NHS due in part to the difference in applied fishing effort. Guyana Quality Seafood Inc. landed nine hundred and fourteen thousand, two hundred and seventy three kilograms (914,273 kgs), representing 10% (*the lowest*) of the total weight landed and the only company to record below a million kilograms processed Seabob after landing.

Figure 2 - Representative analysis of the standardized days at sea usage for the industrial Seabob companies.

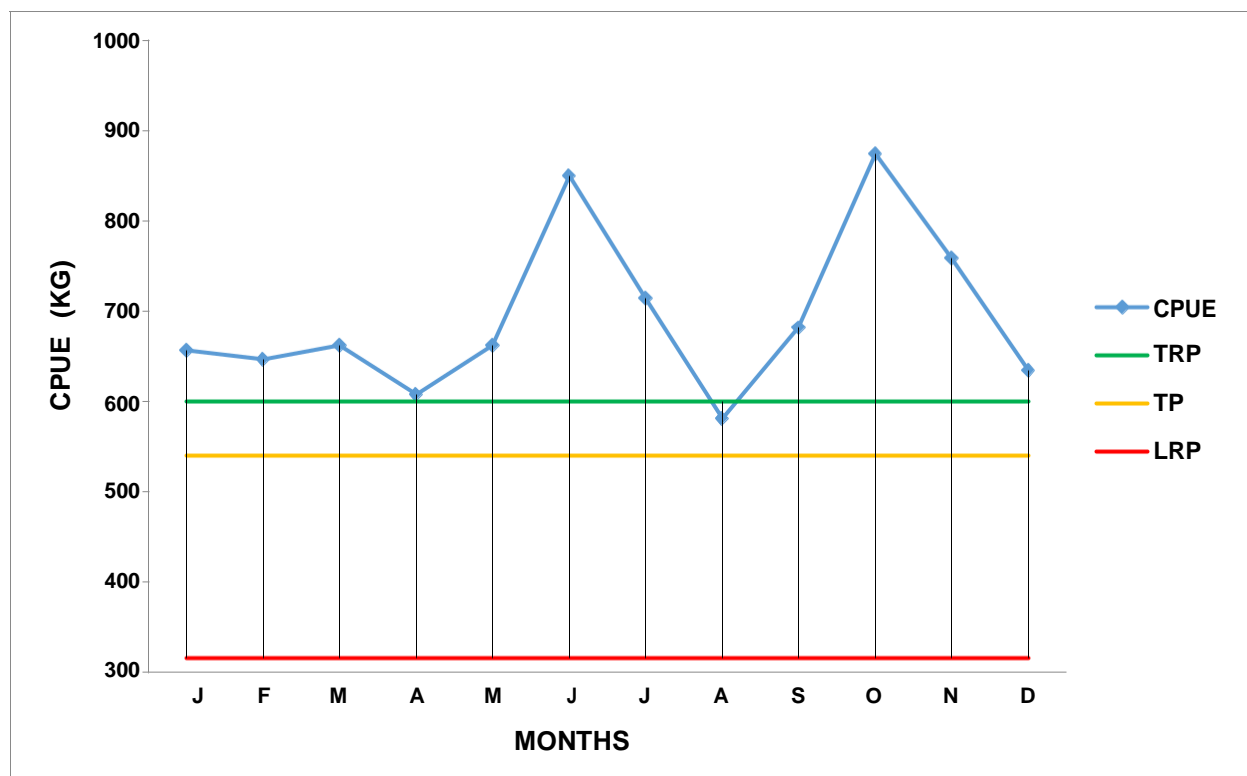


(Source: Seabob CPUE 2016 Data sheet.)

The figure seen above (*i.e. Graph 2*) is a graphical representation of the respective fishing efforts (standardized days at sea/sdas) which were exerted by the aforementioned industrial companies in 2016. Noteworthy, is the fact that the total effort utilized during 2016 was observed to be below the total allowable effort.

Pritipaul Singh Investments Inc. standardized days at sea represents 41% (*~five thousand, six hundred and ninety five sdas*) of the total days utilized by industrial fleet. Noble House Seafood Ltd. `s spent 30% (*~four thousand, one hundred and fifty two sdas*) of the aforesaid expended days. The two companies combined shared the greater majority (71%) of the days spent at sea. The two remaining companies; BEV processors Inc. and Guyana Quality Seafood Inc. were responsible for 19% (*~two thousand, seven hundred and seven sdas*) and 10% (*~one thousand, three hundred and forty five sdas*) respectively, of the total days spent at sea.

Figure 3 - Shows the Seabob Catch Per Unit Effort (CPUE) for Guyana Quality Seafoods Inc. in 2016.



(Source: Seabob CPUE 2016 Data sheet.)

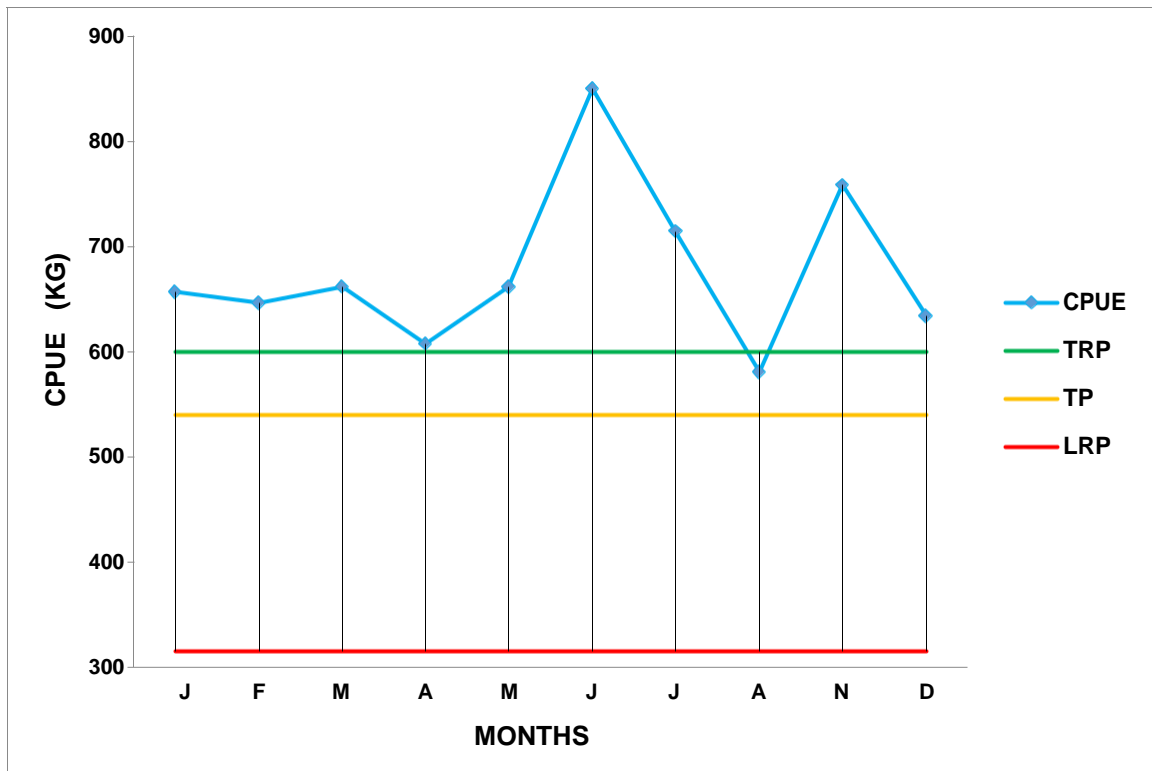
The overall performance¹ of Guyana Quality Seafoods Inc. during 2016 can be considered acceptable as the monthly CPUE were consistently around or above the TRP except for the month of August (581 kg/sdas). Consequently, the overall average for the company was 680 kg/sdas; representing 13% above the target/first trigger and 8% above the alternative target reference point. The highest recorded Seabob CPUE (*i.e. outside of the primary closed seasons months*²) was observed in June (850 kgs/sdas) and the lowest in August (581 kgs/sdas).

Overall the company recorded nine hundred and fourteen thousand, two hundred and seventy three kilograms (914,273 kgs) processed tail weight of seabob; utilising approximately one thousand, three hundred and forty five (~1,345) fishing days to achieve same. The highest recorded processed tail weight of Seabob (*i.e. outside of the primary closed seasons months*) was observed in the month of July (102,948 kgs) and the lowest in February (59,116 kgs).

¹ Table with additional details for each of the four companies can be viewed in the Annex section of this document.

² For most parts of September and October annually, Guyana's Seabob Fishery is closed for a period of approximately seven weeks. During this time the industrial seabob fleets (comprising of 87 vessels licenses) are prohibited from fishing.

Figure 4 - Shows the Seabob Catch Per Unit Effort (CPUE) for BEV Processors Inc. in 2016.

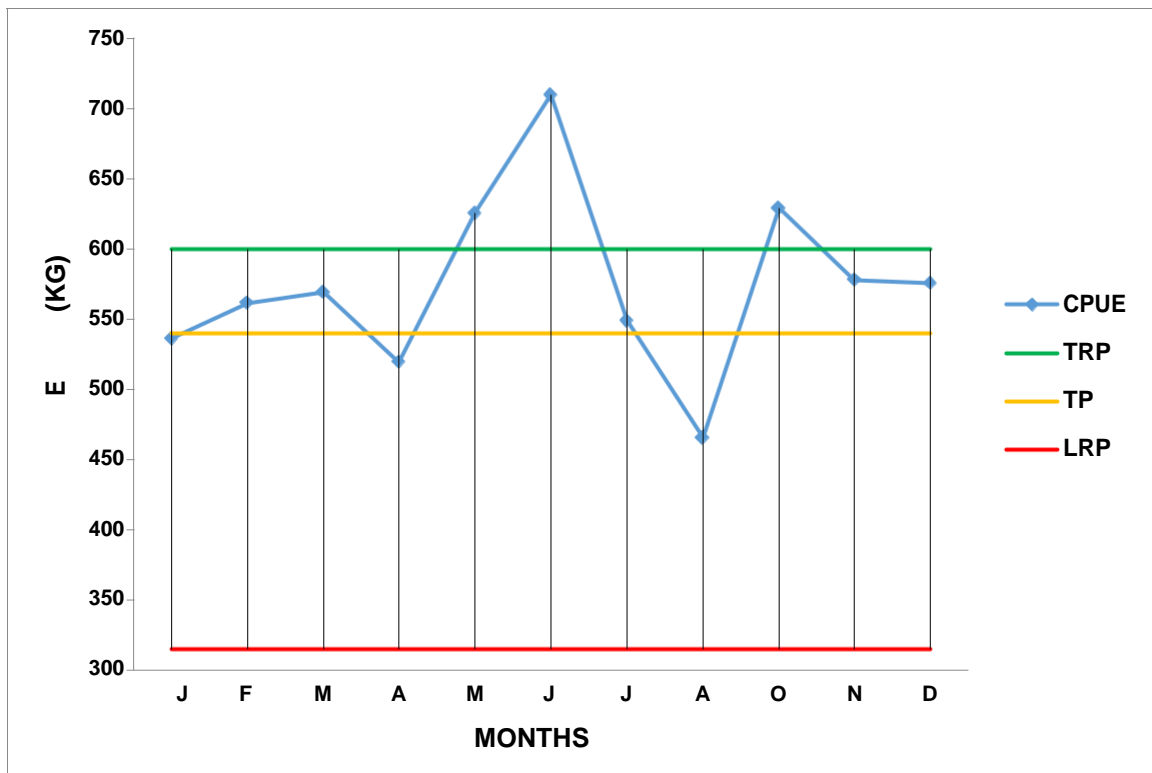


(Source: Seabob CPUE 2016 Data sheet.)

The overall performance of BEV Processors Inc. during 2016 can be considered satisfactory as the monthly CPUE were more often than not above the TRP. Exceptions were observed in the months April and August i.e. 581 and 587 kg/sdas, respectively. The overall average for the company was 677 kg/sdas (*almost mirroring that of GQS*); representing 13% above the target/first trigger and 8% above the alternative target reference point. The highest recorded Seabob CPUE (*i.e. outside of the primary closed seasons months*) was observed in June (850 kgs/sdas) and the lowest in August (581 kgs/sdas).

The company recorded an annual total of one million, eight hundred and thirty one thousand, nine hundred and sixty eight kilograms (1,831,968 kgs) processed tail weight of seabob; exhausting roughly two thousand, seven hundred and seven (2,707) fishing days to accomplish same. The highest recorded processed tail weight of Seabob was realized in the month of February (217,825 kgs) and the lowest in the month of April (153,462 kgs).

Figure 5 - Shows the Seabob Catch Per Unit Effort (CPUE) for Noble House Seafoods Ltd. in 2016.

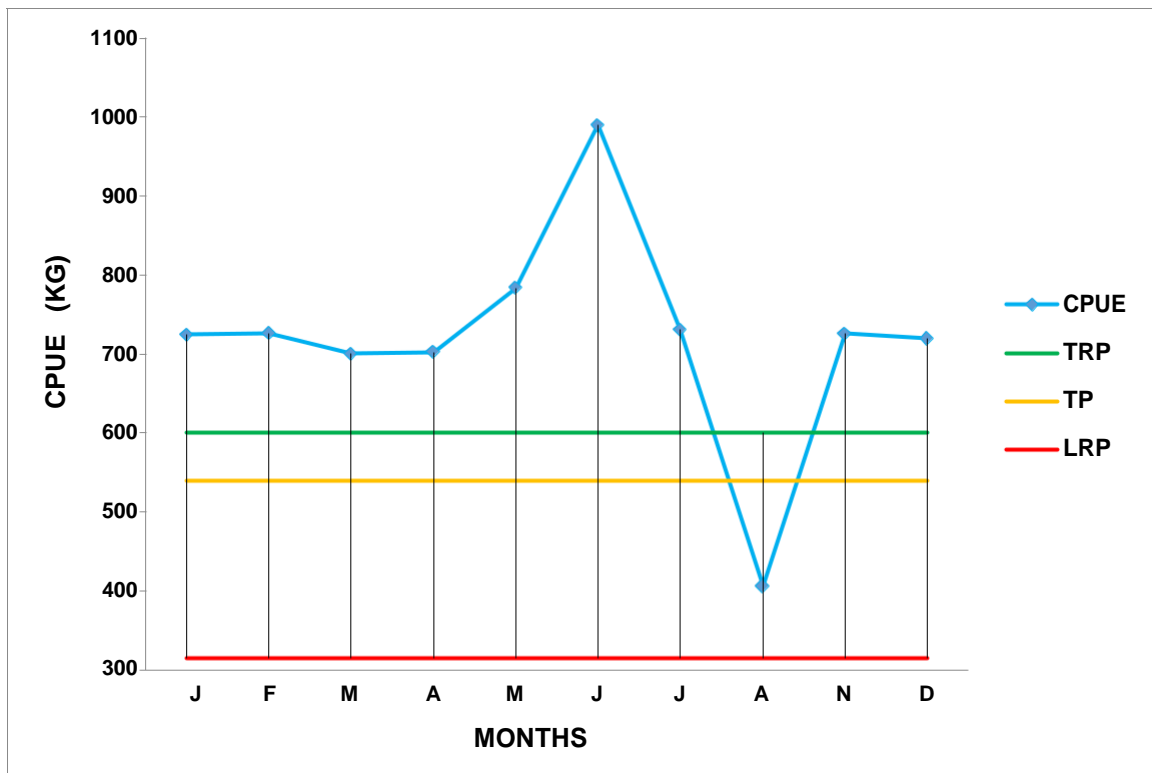


(Source: Seabob CPUE 2016 Data sheet.)

Noble House Seafoods Ltd., recorded the second highest (2,363,594 kgs) processed tail weight of seabob in 2016 when compared against the other processors. Noteworthy also, is the fact that the company's annual catch rate (569 kg/sdas) recorded was the lowest in the aforesaid year and the only company to fall beneath the alternative and target reference points (i.e. 630 & 600 kg/sdas, respectively). This observed rate represents a point 5% below the target/first trigger and 11% below the alternative target reference point. The highest recorded Seabob CPUE (i.e. outside of the primary closed seasons months) was observed in June (710 kgs/sdas) and the lowest in August (466 kgs/sdas). This pattern (i.e. best and least productive months) is synonymous with that of both GQS and BEV.

Overall the company utilized approximately four thousand, one hundred and fifty two (~4,152) fishing days. The highest recorded processed tail weight of Seabob (i.e. outside of the primary closed seasons months) was observed in the month of June (292,778 kgs) and the lowest in August (201,918 kgs).

Figure 6 - Shows the Seabob Catch Per Unit Effort (CPUE) for Pritipaul Singh Investment Inc. in 2016.

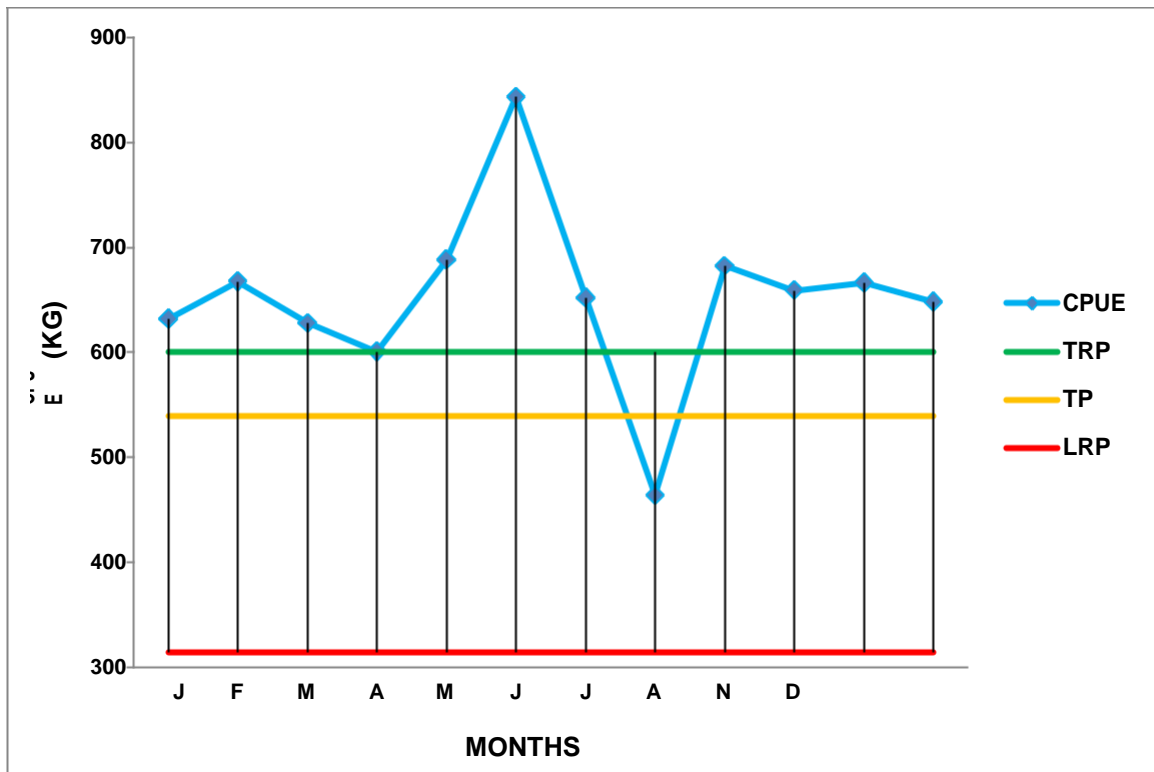


(Source: Seabob CPUE 2016 Data sheet.)

he overall performance of Pritipaul Singh Investment Inc. during 2016 can be considered exceptional, as both the monthly catch and catch rate have demonstrated. PSI has the largest vessel fleet (28) and recorded both the highest overall processed tail weight (4,112,782 kgs) and CPUE (769 kg/sdas) overall, respectively. Further the CPUE was consistently above the TRP except for the month of August (416 kg/sdas). The average catch rate (i.e. 769 kgs/sdas) represents a point; 28% above the target/first trigger and 22% above the alternative target reference point. The highest recorded Seabob CPUE (i.e. outside of the primary closed seasons months) was observed in June (1,131 kgs/sdas) and the lowest in August (416 kgs/sdas).

Overall the company utilized approximately five thousand, three hundred and fifty (~5,350) fishing days. The highest recorded processed tail weight landing of Seabob (i.e. outside of the primary closed seasons months) was observed in the month of June (618,584 kgs) and the lowest in August (240,845 kgs).

Figure 7 - Shows the Seabob Catch Per Unit Effort (CPUE) for the Industry (All Companies) in 2016.



(Source: Seabob CPUE 2016 Data sheet.)

The overall performance of the Seabob Industry during 2016 can be considered acceptable as the monthly catch rates (CPUE) were above both the TRP and the ATRP in all months except for one (i.e. in August; 464 kgs/sdas). The overall CPUE (annual) for the Industry was 649 kgs/sdas; representing 8% above the target/first trigger and a corresponding 3% above the alternative target reference point. The highest recorded Seabob CPUE (i.e. outside of the primary closed seasons months) was observed in June (843 kgs/sdas) and the lowest in August (464 kgs/sdas).

The Industry exhausted roughly thirteen thousand, nine hundred (13,900) fishing days in 2016. The highest recorded total fishing days was observed in the month of December (1,532 sdas) and the lowest (i.e. outside of the primary closed seasons months) in the month of February (1,228 sdas).

9.0 HCR Evaluation

The HCR was evaluated using the 2013 assessment (CRFM 2013). The evaluation procedure is to apply a simplified management strategy evaluation. This is possible because the HCR is simple and does not require sophisticated stock assessments (Medley 2014).

For the calculation of the harvest control rule index either the standardized effort can be calculated based on each trip length or an adjustment made to the total days-at-sea based on the ratio between mean trip length and equivalent estimated fishing days. The former is the preferred method, but the adjustment based on the mean trip length is simpler and should be work well enough as long as vessel operations do not change substantially (Medley 2014).

The TAE found in Annex 1³ of the HCR report, clearly sets out the procedure which should be followed when calculating the DAS adjustments (if any) for the subsequent year. The harvest control rule computation is seen below:

Important Note:

The Total Allowable Effort days-at-Sea (DaS) Quota for 2016/2017:

The DaS Quota for 2017 will be set at the maximum; 225 DaS per vessel, in accordance with bullet point number two (2) under the procedure for setting TAE as seen below:

“A Maximum 225 days at sea per licenced vessel when the indexed catch index is at or above the target index”.

³ See Annex 1 of this report for full procedure.

10.0 Conclusion

The CPUE effort observed throughout 2016 can be considered satisfactory, as is reflected in the annual catch rate of 649 kg/sdas. This result represents a positive deviation of 8% from the target reference point of 600 kg/sdas. Additionally, the annual Seabob landings have increased by ~10% in 2016 when compared to the previous year albeit the overall effort exerted remains constant. This is an encouraging sign and arguably an indicator of a well-designed and managed HCR.

They were a few challenges encountered in 2016, primary of which was the method used to calculate the nominal DaS (i.e. Arrival Date – Departure Date +1). Although the consultant has confirmed that this is the recommended method, the Industry stakeholders are not in favour of same. As a direct result of the stalemate, this aspect of the rule is proving problematic to implement; a situation the department hopes can be resolved in 2017.

11.0 Recommendations

- Research should be conducted on Guyana`s seabob stock in an effort to investigate and understand their spawning dynamics so as to institute measures to optimise overall management of same.
- There should be regional collaboration aimed primarily at cross-examining current closed seasons for seabob and other such stocks in an attempt to build capacity and adaptation of the most appropriate best practices available.
- Comprehensive studies be conducted to assess the effectiveness of the current close season and its application; both duration and period.
- Other stock management initiatives such as closed areas, catch quotas, gear modifications among others can be explored in an effort to optimise stock management in a changing climate.
- Specific studies directed towards gathering relevant information on living conditions such as habitat, temperature, spawning habits, species dynamics among other related parameters will be paramount in guiding the formulation and implementation of polices to promote stock sustainability.

11.0 Annex 1- Procedure for Setting the TAE for Guyana Seabob

The Total Allowable Effort days-at-Sea (DaS) Quota shall be set at:

- Maximum 87 licences to fish seabob
- Maximum 225 days at sea per licenced vessel when the indexed catch index is at or above the target index.
- a linearly declining value when the current index is above the trigger index, but below the target index, according to the calculation (TAE in days at sea per vessel):

$$\text{TAE} = 205 + 20 * (\text{Current Index} - \text{Trigger Index}) / (\text{Target Index} - \text{Trigger Index})$$

- a linearly declining value when the current index is above the limit index, but below the trigger index, according to the calculation (TAE in days at sea per vessel):

$$\text{TAE} = 205 * (\text{Current Index} - \text{Limit Index}) / (\text{Trigger Index} - \text{Limit Index})$$

- zero (there is an export moratorium) if the current index is at or below the limit index.

The current index for each year shall be calculated as the average between the previous year's index value and the catch rate of the previous year (i.e. a moving average). The catch rate will be based on reported catch and effort data for all vessels. The catch rate is calculated as the total landings of seabob processed (peeled tail) weight in kilograms divided by the total number of standardised days-at-sea.

The HCR Index in any given year t (I_t) is calculated as:

$$I_t = 0.5 \left(I_{t-1} + \frac{C_{t-1}}{0.766 D_{t-1}} \right)$$

Where C_{t-1} =catch (kg processed tail weight) in the year $t-1$ and D_{t-1} = total nominal days-at-sea required to catch C_{t-1} . The index calculation should include all observed reliable catch and effort data.

11.1 Annex 2 - Seabob CPUE 2016

GUYANA QUALITY SEAFOODS SEABOB CPUE 2016			
Months	Processed Weight (kgs)	Standardised Days-At-Sea (sdas)	Catch Per Unit Effort (CPUE)
January	78,865	120.093	657
February	59,116	91.442	646
March	79,253	119.733	662
April	67,777	111.519	608
May	92,979	140.482	662
June	95,976	112.854	850
July	102,948	144.055	715
August	89,155	153.490	581
September	4,488	6.582	682
October	21,425	24.512	874
November	116,156	153.089	759
December	106,135	167.343	634
	914,273	1,345,194	680

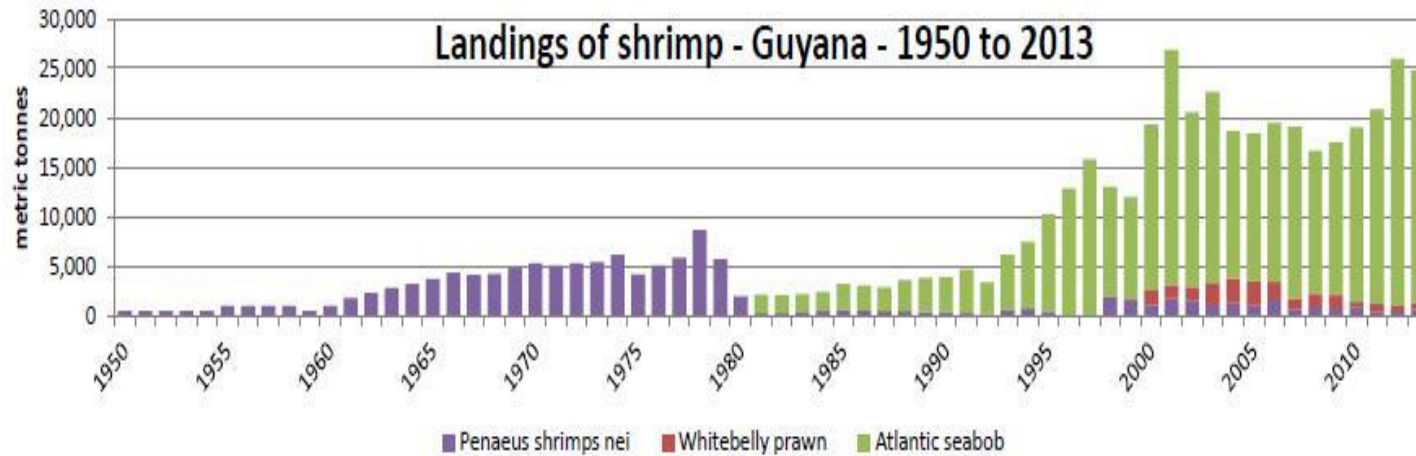
NOBLE HOUSE SEAFOODS. SEABOB CPUE 2016			
Months	Processed Weight (kgs)	Standardised Days-At-Sea (sdas)	Catch Per Unit Effort (CPUE)
January	211,454	431.959	490
February	185,518	361.936	513
March	208,802	401.811	520
April	190,805	402.418	474
May	230,230	403.172	571
June	267,319	412.420	648
July	202,377	403.579	501
August	184,360	433.737	425
September	No Data: Closed Season		
October	35,790	62.316	574
November	231,414	438.614	528
December	209,996	399.580	526
	2,158,064	4,151,542	520

B.E.V PROCESSORS INC. SEABOB CPUE 2016			
Months	Processed Weight (kgs)	Standardised Days-At-Sea (sdas)	Catch Per Unit Effort (CPUE)
January	164,112	237.479	691
February	217,825	283.101	769
March	163,457	261.747	624
April	153,462	263.960	581
May	172,948	253.261	683
June	209,382	263.151	796
July	195,819	293.485	667
August	159,410	271.444	587
September	No Data: Closed Season		
October	No Data: Closed Season		
November	191,150	270.660	706
December	204,404	308.826	662
	1,831,968	2,707,114	677

PRITIPAUL SINGH INVESTMENT SEABOB CPUE			
Months	Processed Weight (kgs)	Standardised Days-At-Sea (sdas)	Catch Per Unit Effort (CPUE)
January	349,255	482.170	724
February	356,723	491.022	726
March	390,173	557.162	700
April	380,948	542.262	703
May	428,127	546.201	784
June	618,584	625.105	990
July	437,911	599.264	731
August	240,845	593.237	406
September	No Data: Closed Season		
October	No Data: Closed Season		
November	437,914	603.232	726
December	472,302	656.088	720
	4,112,782	5,695,743	722

INDUSTRIAL SEABOB CPUE 2016			
Months	Processed Weight (kgs)	Standardised Days-At-Sea (sdas)	Catch Per Unit Effort (CPUE)
January	803,686	1,271.701	632
February	819,181	1,227.501	667
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November	976,634	1,465.595	666
December	992,836	1,531.837	648
	<u>9,017,087</u>	<u>13,899,593</u>	<u>649</u>

11.1 Annex 3 – Landings of shrimp – Guyana



Seabob are caught inside 50m, with the zone inside 15m used exclusively by the artisanal sector; Penaeid shrimps nei are caught in the zone just outside that inhabited by seabob; white belly tend to be inshore and overlapping with seabob

The penaeid shrimp trawl fishery collapsed in the late 1980s; it was from this time that the seabob fishery began, exploiting a resource located in shallower water than the penaeid shrimp trawl fishery