

# **Ministry of Agriculture Fisheries Department**

## **Seabob Catch per Unit Effort (CPUE) Annual Report 2017**

**Mr. Seion Richardson  
Fisheries Officer**

## ABSTRACT

The Atlantic seabob shrimp (*Xiphopenaeus kroyeri*) is the currently the major shrimp species harvested by Guyana`s industrial fleet of vessels. These vessels are owned and operated primarily by private sector stakeholders within the fisheries sector. Production data from the fishery is routinely submitted by the companies (electronic and hard format) to the Fisheries Department; as part of a licensing arrangement, which in turn is analyzed for trends using Microsoft Excel. This data is complemented by catch and effort collected by fisheries staff in occurrence with a planned monthly sampling schedule.

The results of said analysis are customarily reported to thru the Seabob Working Group (SWG); which is the technical entity responsible for the management of the seabob stock in view of attainment of the MSC certification to the relevant stakeholders. The CPUE observed for the year (2017) can be considered satisfactory (i.e. 715 kgs/sdas). The results represent a point 19% above the target/first trigger and a corresponding 13% above the alternative target reference point. The aforesaid catch rate was 10% more than that obtained in 2016 (649 kgs/sdas). Additionally, the annual processed tail weight of seabob has increased by ~10% in 2017 while the overall effort<sup>1</sup> (DaS) decreased by 0.08%, when compared to the previous year, respectively.

---

<sup>1</sup>The formula used to calculate total effort per trip/DaS in 2017 was DOA-DOD instead of DOA-DOD+1 which was used in the past years. This directly resulted in one less (i.e. -1) day for every trip made when compared to previous years.

## TABLE OF CONTENTS

<b>LIST OF FIGURES</b> .....	<b>4</b>
<b>LIST OF TABLES</b> .....	<b>4</b>
<b>LIST OF ABBREVIATIONS</b> .....	<b>5</b>
<b>1. INTRODUCTION</b> .....	<b>6</b>
1.1 BACKGROUND .....	7
<b>2. HCR DESCRIPTION</b> .....	<b>8</b>
<b>3. DATA PRESENTATION AND ANALYSIS</b> .....	<b>9</b>
3.1 CATCH AND EFFORT OVERVIEW .....	9
3.1.1 CATCH .....	10
3.1.2 EFFORT .....	11
3.2 INDUSTRIAL (ALL COMPANIES) CPUE .....	12
3.2.1 GUYANA INVESTMENT INC. CPUE .....	13
3.2.2 BEV PROCESSORS INC. CPUE.....	14
3.2.3 NOBLE HOUSE SEAFOODS LTD. CPUE .....	15
3.2.4 PRITIPAUL SINGH INVESTMENT INC. CPUE .....	16
<b>4. HCR CALCULATION</b> .....	<b>17</b>
<b>5. CONCLUSION</b> .....	<b>18</b>
5.1 RECOMMENDATIONS .....	19
<b>6. APPENDICES</b> .....	<b>20</b>
6.1 ANNEX 1 - PROCEDURE FOR SETTING THE TAE FOR GUYANA SEABOB.....	20
6.2 ANNEX 2 - SEABOB CPUE 2017 .....	21
6.3 ANNEX 3 – GUYANA SHRIMP LANDINGS .....	22

## LIST OF FIGURES

Figure 1 - Graph showing Guyana`s industrial processed Seabob landings 2017 by company. ....	10
Figure 2 - Graph showing the standardized days-at-sea (sdas) usage by company in 2017.....	11
Figure 3 - Graph showing the Seabob Catch Per Unit Effort (CPUE) for Guyana Investment Inc. in 2017. ....	12
Figure 4 - Graph showing the Seabob Catch Per Unit Effort (CPUE) for BEV Processors Inc. in 2017. ....	14
Figure 5 - Graph showing the Seabob Catch Per Unit Effort (CPUE) for Noble House Seafoods Ltd. in 2017. ....	15
Figure 6 - Graph showing the Seabob Catch Per Unit Effort (CPUE) for Pritipaul Singh Investment Inc. in 2017. ....	16
Figure 7 - Graph showing the Seabob Catch Per Unit Effort (CPUE) for the Industry (all companies) in 2017. ....	12

## LIST OF TABLES

Table 1 - Shows the HCR index reference points used in developing a precautionary HCR. ....	8
Table 2 - Shows a summary of Guyana`s industrial processed Seabob landings 2017. ....	9
Table 3 - Shows Guyana`s industrial processed Seabob landings 2017 by company. ....	10

## LIST OF ABBREVIATIONS

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
DOA	Date of Arrival
DOD	Date of Departure
ETP	Endangered, threatened and protected
FD	Fisheries Department
GATOSP	Guyana Association of Trawler Owners and Seafood Processors
GI	Guyana Investment Inc.
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

## 1. 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.

Guyana`s Seabob Trawl fishery is a closed fishery which allows for 87 vessels to fish for 225 days each. The vessels that went fishing throughout the year are divided up amongst 4 companies; Guyana Investment Inc. (GII) *whose name changed from Guyana Quality Seafoods*, BEV Processors (BEV), Noble House Seafoods Ltd. (NHS) and Pritipaul Singh Investment Inc. (PSI). The individual catch rates (CPUE) observed by three of the companies with the exception of NHS (553 kg/sdas) were above the target reference point (TRP). Consequently, the annual catch rate was 715 kg/sdas; representing a point reasonably above the TRP. What follows is a detailed representation of the Seabob CPUE trends observed during the year 2017.

## 1.1 BACKGROUND

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).

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 87 licenses with an allocated 225 days-at-sea each. The HCR has since been implemented (2014), monitored and enforced by the key stakeholders, particularly the FD and the SWG.

## 2. 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 - Shows the HCR index reference points used in developing a precautionary HCR.

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



### 3. DATA PRESENTATION AND ANALYSIS

#### 3.1 CATCH AND EFFORT OVERVIEW

A total of eighty three (84) vessels operated in 2017, spending approximately thirteen thousand, eight hundred and eighty nine standardized days-at-sea (13,889 sdas). A sum of nine million, nine hundred and twenty seven thousand, three hundred and eighty seven kilograms (9,927,387 kgs) of seabob was processed after landing. The observed catch per unit effort (CPUE) was seven hundred and fifteen kilograms per standardized day-at-sea (715 kg/sdas). The Seabob vessels were permitted to operate between the 7-18 fathom lines which were established along Guyana's coastline, within the Exclusive Economic Zone.

Table 2 - Shows a summary of Guyana's industrial processed Seabob landings 2017.

INDUSTRIAL SEABOB CPUE 2017			
Months	Processed Weight (kg)	Standardised DAS (sdas)	Monthly CPUE (kg/sdas)
January	1,079,398	1,258.611	858
February	896,722	1,280.435	700
March	1,291,901	1,460.213	885
April	1,220,390	1,340.084	911
May	1,215,832	1,418.803	857
June	1,109,890	1,403.516	791
July	729,012	1,478.252	493
August	12,973	38.868	334
September	11,412	49.921	229
October	543,941	1,293.694	420
November	969,293	1,439.087	674
December	846,623	1,427.341	593
	<b>9,927,387</b>	<b>13,888.825</b>	<b>715</b>

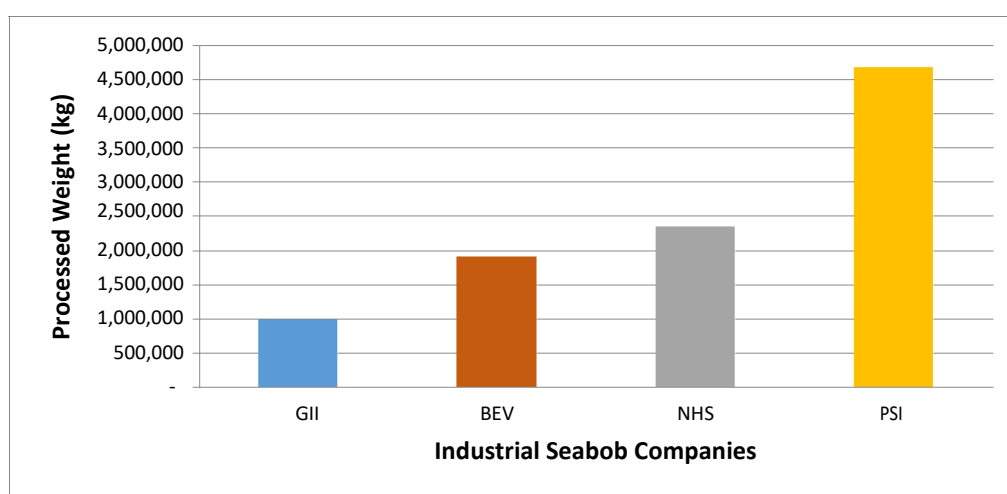
The close season was observed during August 1<sup>st</sup> to September 18<sup>th</sup>, 2017 (both dates inclusive).

### 3.1.1 CATCH

Table 3 - Shows Guyana`s industrial processed Seabob landings 2017 by company.

Seabob CPUE 2017 by Company				
Companies	Processed Wt (kg)	% Breakdown	Standardised DAS (sdas)	% Breakdown
GII	989,529	10	1,556.413	11
BEV	1,910,197	19	2,549.063	18
NHS	2,344,454	24	4,238.248	31
PSI	4,683,207	47	5,545.101	40
<b>Total</b>	<b>9,927,387</b>	<b>100</b>	<b>13,888.825</b>	<b>100</b>

Figure 1 - Graph showing Guyana`s industrial processed Seabob landings 2017 by company.

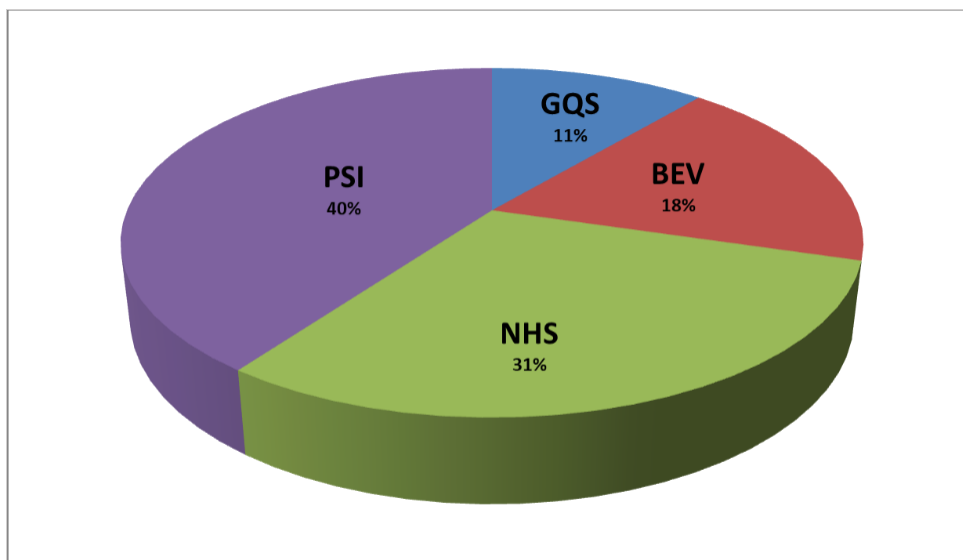


Source: Seabob CPUE 2017 datasheet

The table/graph above represents the total number of seabob processed after landing (*kilograms*) by each of the industrial Seabob companies. From January to December 2017, a total of nine million, nine hundred and twenty seven thousand, three hundred and eighty seven kilograms (*9,927,387 kgs*) of seabob was processed after landing. Pritipaul Singh Investments Inc. landed four million, six hundred and eighty three thousand, two hundred and seven kilograms (*4,112,782 kgs*) of that amount; this represents *47% (the highest)* of the total weight. Noble House Seafoods Ltd. landed two million, three hundred and forty four thousand, four hundred and fifty four kilograms (*2,344,454 kgs*), this translated to *24% (the second highest)* of the total weight. BEV processors Inc. landed one million, nine hundred and ten thousand, one hundred and ninety seven kilograms (*1,910,197 kgs*), representing *19% (the penultimate lowest)* of the total weight; lower than both PSI and NHS due in part to the difference in applied fishing effort as a result of a smaller fleet size. Guyana Investment Inc. landed nine hundred and eighty nine thousand, five hundred and twenty nine kilograms (*989,529 kgs*), representing *10% (the lowest)* of the total weight landed and the only company to record below one million kilograms, processed Seabob after landing.

### 3.1.2 EFFORT

Figure 2 - Graph showing the standardized days-at-sea (sdas) usage by company in 2017.



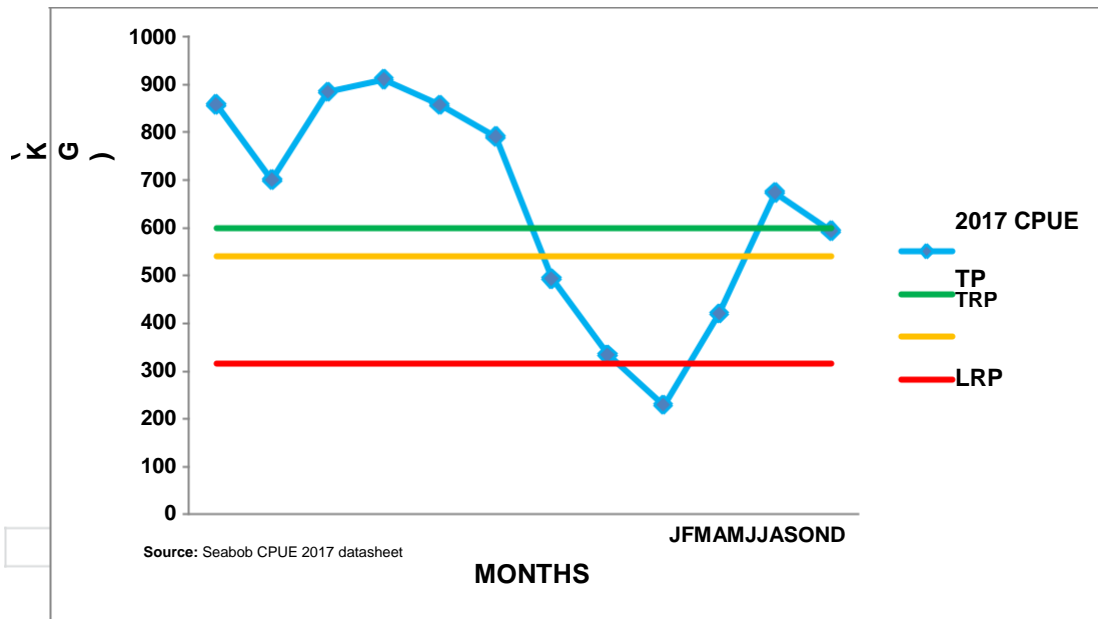
Source: Seabob CPUE 2017 datasheet

Figure 2 is a graphical representation of the respective fishing efforts (*standardized days at sea/sdas*) which were exerted by the aforementioned industrial companies in 2017 (see **Table 3**). Noteworthy, is the fact that the total effort utilized during 2017 was observed to be below the total allowable effort which is approximately 15,000 sdas.

Pritipaul Singh Investments Inc. standardized days at sea represents 40% (~five thousand, five hundred and forty five sdas) of the total days utilized by industrial fleet. Noble House Seafood Ltd. `s spent 31 % (~four thousand, two hundred and thirty eight sdas) of the aforesaid 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 Investment Inc. were responsible for 18% (~two thousand, five hundred and forty nine sdas) and 11% (~one thousand, five hundred and fifty six sdas) respectively, of the total days spent at sea.

### 3.2 INDUSTRIAL (ALL COMPANIES) CPUE

Figure 3 - Graph showing the Seabob Catch Per Unit Effort (CPUE) for the Industry (all companies) in 2017.



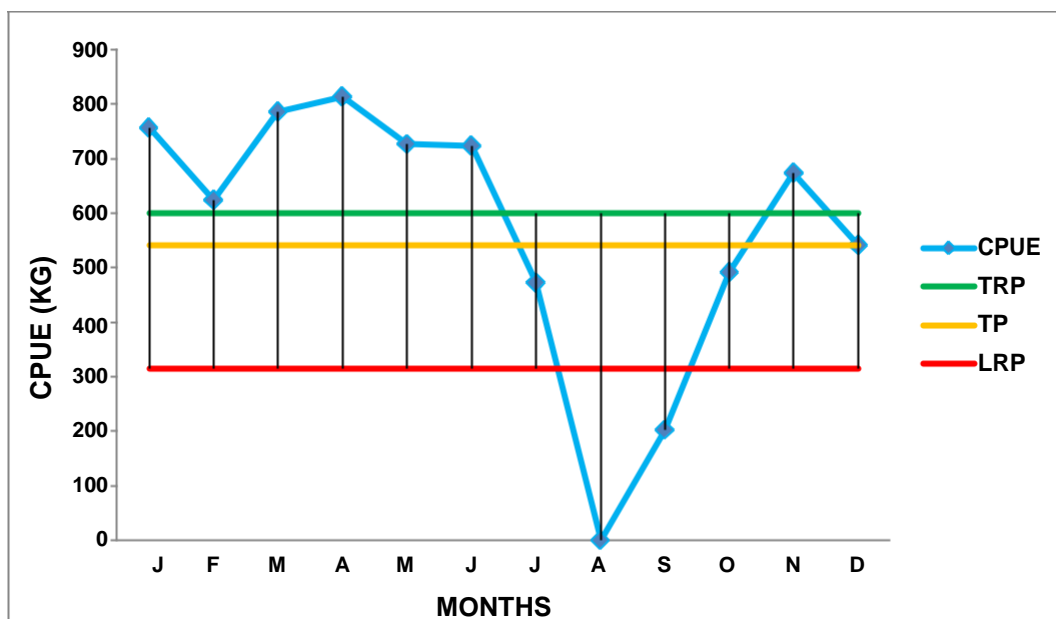
Source: Seabob CPUE 2017 datasheet

The overall performance of the Seabob Industry during 2017 can be considered acceptable as the monthly catch rates (CPUE) were above both the TRP and the ATRP in all months except for July (493 kgs/sdas), October (420 kgs/sdas) and December (593 kgs/sdas). The overall CPUE (annual) for the Industry was 715 kgs/sdas; representing 19% above the target/first trigger and a corresponding 13% above the alternative target reference point. The highest recorded Seabob CPUE (*i.e. outside of the primary closed seasons months*) was observed in April (911 kgs/sdas) and the lowest in October (420 kgs/sdas). The Industry recorded a total of nine million, nine hundred and twenty seven thousand, three hundred and eighty seven kilograms (9,927,387 kgs) processed tail weight of seabob in 2017. The highest recorded processed tail weight of Seabob (*i.e. outside of the primary closed seasons months*) was observed in the month of March (1,291,901 kgs) and the lowest in October (543,941 kgs).

The Industry collectively exhausted thirteen thousand, eight hundred and eighty nine (13,889) fishing days between January to December, 2017. The highest recorded total fishing days was observed in the month of July (1,478 sdas) and the lowest (*i.e. outside of the primary closed seasons months*) in the month of January (1,259 sdas).

### 3.2.1 GUYANA INVESTMENT INC. CPUE

Figure 4 - Graph showing the Seabob Catch Per Unit Effort (CPUE) for Guyana Investment Inc. in 2017.



Source: Seabob CPUE 2017 datasheet

The overall performance<sup>2</sup> of Guyana Investment Inc. during 2017 can be considered acceptable, as the monthly CPUE (*i.e. outside of the primary close season month*) were consistently around or above the TRP except for the months of July (472 kg/sdas), October (491 kg/sdas) and December (542 kg/sdas). Consequently, the annual catch rate for the company was 636 kg/sdas; representing 6% above the target/first trigger and 1% below the alternative target reference point. The highest recorded Seabob CPUE (*i.e. outside of the primary close season month*<sup>3</sup>) was observed in April (813 kgs/sdas) and the lowest in July (472 kgs/sdas). Overall the company produced nine hundred and eighty nine thousand, five hundred and twenty nine kilograms (989,529 kgs) processed tail weight of seabob. The highest recorded processed tail weight of Seabob (*i.e. outside of the primary close season month*) was observed in the month of March (115,259 kgs) and the lowest in February (87,198 kgs).

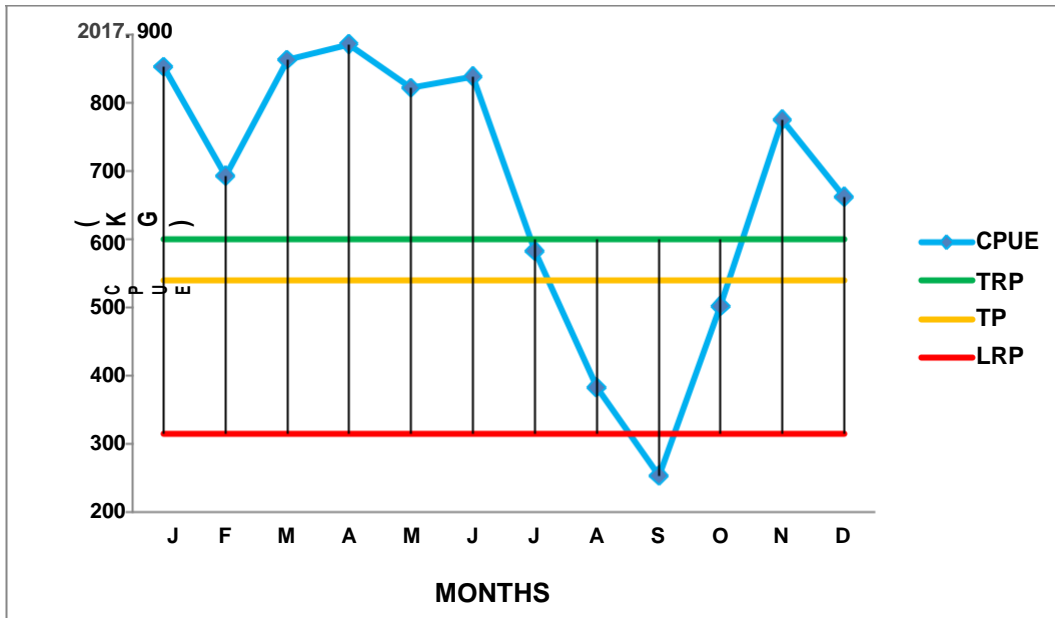
Guyana Investment Inc. (GI) utilized a total of one thousand, five hundred and fifty six (1,556) fishing days between January to December, 2017. The highest recorded total fishing days was observed in the month of July (210 sdas) and the lowest (*i.e. outside of the primary closed seasons months*) in the month of January (115 sdas).

<sup>2</sup>Tables with additional detail for each of the four companies can be viewed in the Annex section of this document.

<sup>3</sup>The close season was observed during August 1<sup>st</sup> to September 18<sup>th</sup>, 2017 (both dates inclusive).

### 3.2.2 BEV PROCESSORS INC. CPUE

Figure 5 - Graph showing the Seabob Catch Per Unit Effort (CPUE) for BEV Processors Inc. in



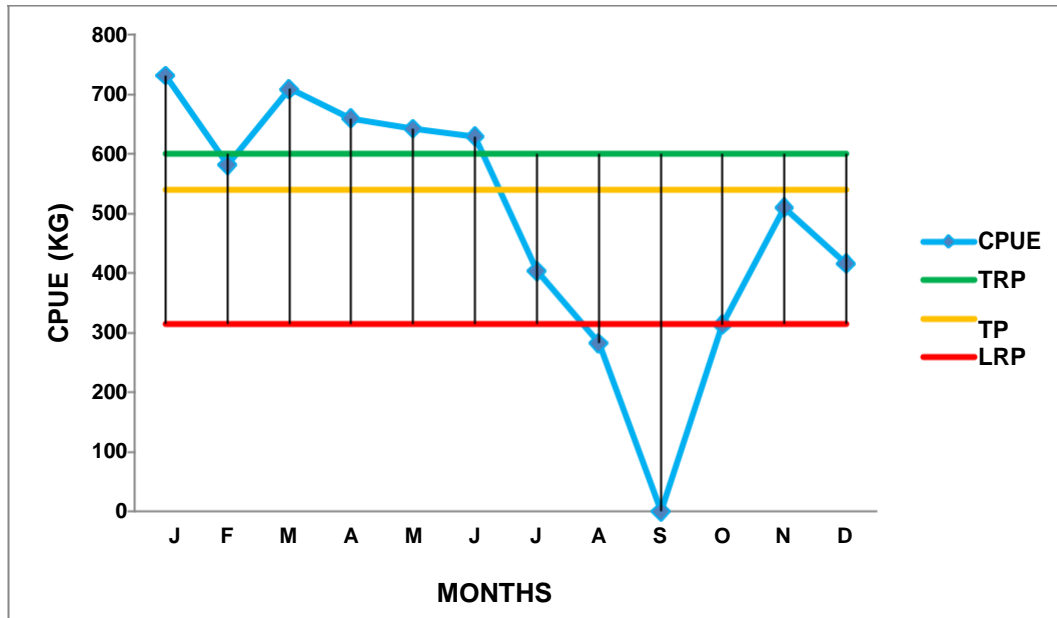
Source: Seabob CPUE 2017 datasheet

The overall performance of BEV Processors Inc. during 2017 can be considered satisfactory as the monthly CPUE were more often than not above the TRP. Exceptions were observed in the months of July and October i.e. 583 and 502 kg/sdas, respectively. The overall average for the company was 749 kg/sdas; representing 25% above the target/first trigger and 19% above the alternative target reference point. The highest recorded Seabob CPUE (*i.e. outside of the primary closed seasons months*) was observed in April (886 kgs/sdas) and the lowest in October (502 kgs/sdas). The company recorded an annual total of one million, nine hundred and ten thousand, one hundred and ninety seven kilograms (1,910,197 kgs) processed tail weight of seabob. The highest recorded processed tail weight of Seabob was realized in the month of June (237,222 kgs) and the lowest in the month of October (88,467 kgs).

BEV Processors Inc. (BEV) spent a total of two thousand, five hundred and forty nine (2,549) fishing days between January to December, 2017. The highest recorded total fishing days was observed in the month of June (283 sdas) and the lowest (*i.e. outside of the primary closed seasons months*) in the month of October (176 sdas).

### 3.2.3 NOBLE HOUSE SEAFOODS LTD. CPUE

Figure 6 - Graph showing the Seabob Catch Per Unit Effort (CPUE) for Noble House Seafoods Ltd. in 2017.



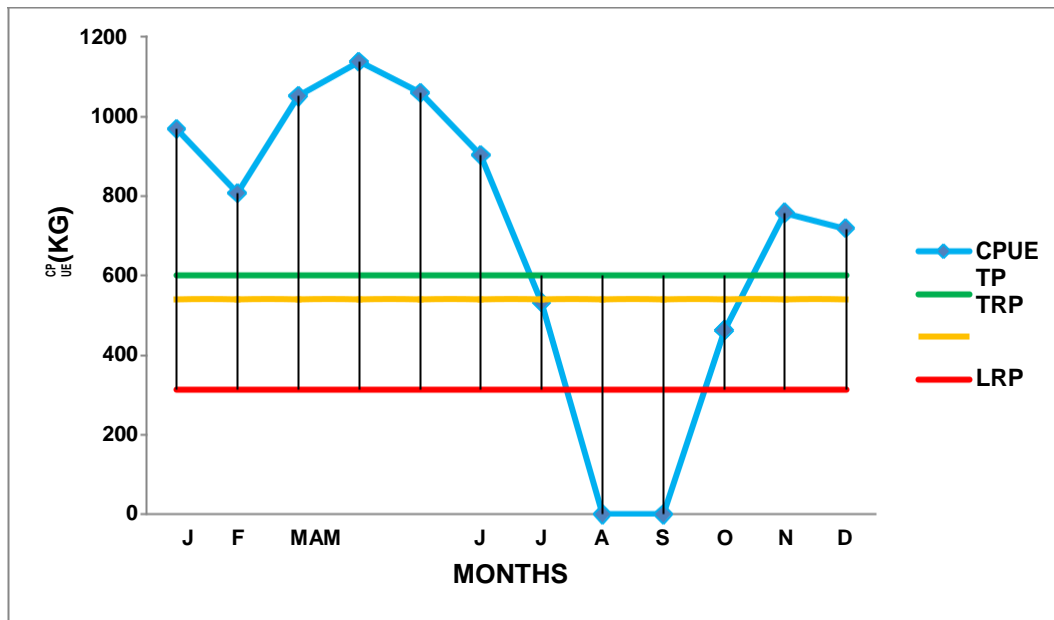
Source: Seabob CPUE 2017 datasheet

Noble House Seafoods Ltd., recorded the second highest (2,344,454 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 (553 kg/sdas) recorded was the lowest amongst the companies; 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 8% below the target/first trigger and 12% below the alternative target reference point. The highest recorded Seabob CPUE (i.e. outside of the primary closed seasons months) was observed in January (731 kgs/sdas) and the lowest in October (313 kgs/sdas). The company produced a total of two million, three hundred and forty four thousand, four hundred and fifty four kilograms (2,344,454 kgs) processed tail weight of seabob in 2017. The highest recorded processed tail weight of Seabob (i.e. outside of the primary closed seasons months) was observed in the month of March (319,672 kgs) and the lowest in October (139,472 kgs).

Noble House Seafoods Ltd. (NHS) exhausted a total of four thousand, two hundred and thirty eight (4,238) fishing days between January to December, 2017. The highest recorded total fishing days was observed in the month of November (456 sdas) and the lowest (i.e. outside of the primary closed seasons months) in the month of February (370 sdas).

### 3.2.4 PRITIPAUL SINGH INVESTMENT INC. CPUE

Figure 7 - Graph showing the Seabob Catch Per Unit Effort (CPUE) for Pritipaul Singh Investment Inc. in 2017.



Source: Seabob CPUE 2017 datasheet

The overall performance of Pritipaul Singh Investment Inc. (PSI) during 2017 can be considered exceptional, as both the monthly catch and catch rate have demonstrated. PSI; which boasts the largest vessel fleet (28), recorded both the highest annual processed tail weight (4,683,207 kgs) and catch rate (845 kg/sdas), respectively. Further, the CPUE was consistently above the TRP except for the months of July (532 kg/sdas) and October (462 kg/sdas). The average catch rate (i.e. 845 kgs/sdas) represents a point; 41% above the target/first trigger and 34% above the alternative target reference point. The highest recorded Seabob CPUE (i.e. outside of the primary closed seasons months) was observed in April (1,136 kgs/sdas) and the lowest in October (462 kgs/sdas). Overall the company produced nine hundred and eighty nine thousand, five hundred and twenty nine kilograms (4,683,207 kgs) processed tail weight of seabob. The highest recorded processed tail weight landing of Seabob (i.e. outside of the primary closed seasons months) was observed in the month of March (632,775 kgs) and the lowest in October (227,575 kgs).

Pritipaul Singh Investment Inc. (PSI) exhausted a total of five thousand, five hundred and forty five (5,545) fishing days between January to December, 2017. The highest recorded total fishing days was observed in the month of March (603 sdas) and the lowest (i.e. outside of the primary closed seasons months) in the month of October (492 sdas).



#### 4. HCR CALCULATION

For the calculation of the harvest control rule index the standardized effort was calculated based on each trip length. The TAE (Days-at-sea) was calculated using the procedure<sup>4</sup> recommended in the HCR rule report, 2014. Please see calculation below:

**Important Note:**

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:

$$I_t = \frac{I_{t-1} + CR_{t-1}}{2}$$

Therefore the TAE (DaS) Quota for 2018 is as follows:

**Current Index Value calculation:**

$$\{ I_{2017}, CR_{2017} \}$$

The DaS Quota for 2018 will be set at the maximum; 225 DaS per vessel, in accordance with bullet point number two (2) under the procedure for setting TAE i.e. "A Maximum 225 days at sea per licenced vessel when the indexed catch index is at or above the target index".

---

<sup>4</sup> See Annex 1 of this report for full procedure.

## 5. CONCLUSION

The CPUE effort observed for the year 2017 can be considered acceptable, as the CPUE observed (i.e. 715 kgs/sdas) was 19% above the target/first trigger and a corresponding 13% above the alternative target reference point. The aforesaid catch rate was 10% more than that obtained in 2016 (649 kgs/sdas). Additionally, the annual processed tail weight of seabob has increased by ~10% in 2017 while the overall effort<sup>5</sup> (DaS) decreased by 0.08%, when compared to the previous year, respectively. This is an encouraging sign and arguably an indicator of a well-designed and managed HCR.

A stakeholder meeting was held mid-way of 2017 to discuss the appropriate method to use when calculating Nominal Das and/ Total Allowable Effort. The Department use of the formula “Arrival Date – Departure Date +1” was rejected by the Industry. The Industry instead proposed; “Arrival Date – Departure Date + Time (hrs/mins/sec)” which the Department rejected. Following a stalemate, an agreement was made (by the majority present) to utilise the formula “Arrival Date – Departure Date”, until a next stock assessment is conducted. Hence this method was used throughout the DaS calculations for 2017 to establish some level of consistency.

---

<sup>5</sup>The formula used to calculate total effort per trip/DaS in 2017 was DOA-DOD instead of DOA-DOD+1 which was used in the past years. This directly resulted in one less (i.e. -1) day for every trip made when compared to previous years.

## 5.1 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.
- Comprehensive studies be conducted to assess the effectiveness of the current close season and its application; both duration and period.
- 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.
- 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.

## 6. APPENDICES

### 6.1 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):

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

- 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):

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

- 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.

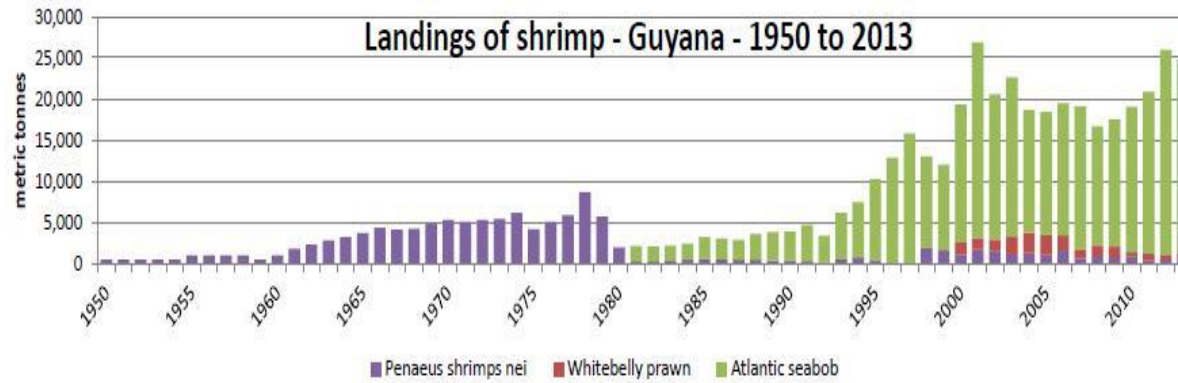
## 6.2 ANNEX 2 - SEABOB CPUE 2017

GUYANA INVESTMENT INC. SEABOB CPUE 2017				B.E.V PROCESSORS INC. SEABOB CPUE 2017				NOBLE HOUSE SEAFOODS. SEABOB CPUE 2017			
Months	Processed Weight (kg)	Standardised DAS (sdas)	Monthly CPUE (kg/sdas)	Months	Processed Weight (kg)	Standardise d DAS (sdas)	Monthly CPUE (kg/sdas)	Months	Processed Weight (kg)	Standardised DAS (sdas)	Monthly CPUE (kg/sdas)
January	87,198	115.242	757	January	197,477	231.670	852	January	270,883	370.632	731
February	89,432	143.314	624	February	162,523	234.459	693	February	214,885	369.916	581
March	115,259	146.599	786	March	224,195	259.840	863	March	319,672	451.268	708
April	110,909	136.343	813	April	230,446	260.134	886	April	266,923	404.868	659
May	99,120	136.432	727	May	230,293	280.218	822	May	268,712	418.458	642
June	93,386	129.014	724	June	237,222	282.942	838	June	265,829	422.636	629
July	99,166	209.900	472	July	145,278	249.155	583	July	179,993	446.611	403
August	-	-	-	August	7,598	19.810	384	August	5,375	19.058	282
September	4,939	24.420	202	September	6,474	25.501	254	September	-	-	-
October	88,427	179.984	491	October	88,467	176.216	502	October	139,472	445.368	313
November	102,433	151.894	674	November	204,732	264.000	775	November	232,389	455.937	510
December	99,260	183.271	542	December	175,493	265.118	662	December	180,320	433.496	416
	<b>989,529</b>	<b>1,556.413</b>	<b>636</b>		<b>1,910,197</b>	<b>2,549.063</b>	<b>749</b>		<b>2,344,454</b>	<b>4,238.248</b>	<b>553</b>

PRITIPAUL SINGH INVESTMENT SEABOB CPUE 2017				INDUSTRIAL SEABOB CPUE 2017			
Months	Processed Weight (kg)	Standardised DAS (sdas)	Monthly CPUE (kg/sdas)	Months	Processed Weight (kg)	Standardise d DAS (sdas)	Monthly CPUE (kg/sdas)
January	523,841	541.067	968	January	1,079,398	1,258.611	858
February	429,882	532.746	807	February	896,722	1,280.435	700
March	632,775	602.506	1050	March	1,291,901	1,460.213	885
April	612,111	538.739	1136	April	1,220,390	1,340.084	911
May	617,707	583.695	1058	May	1,215,832	1,418.803	857
June	513,452	568.924	902	June	1,109,890	1,403.516	791
July	304,575	572.586	532	July	729,012	1,478.252	493
August	-	-	-	August	12,973	38.868	334
September	-	-	-	September	11,412	49.921	229
October	227,575	492.126	462	October	543,941	1,293.694	420
November	429,739	567.256	758	November	969,293	1,439.087	674
December	391,550	545.456	718	December	846,623	1,427.341	593
	<b>4,683,207</b>	<b>5,545.101</b>	<b>845</b>		<b>9,927,387</b>	<b>13,888.825</b>	<b>715</b>



### 6.3 ANNEX 3 – GUYANA SHRIMP LANDINGS



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