



SCIENTIFIC COUNCIL MEETING – NOVEMBER 2001

Short-time Variation in Catch-per-Unit-Effort (CPUE) of Shrimp (*Pandalus borealis*) at the Flemish Cap

by

Jón Kristjánsson

Fiski- Fisheries Management, Reykjavík Iceland.
e-mail: jon@fiski.com - URL: <http://www.fiski.com>

Abstract

Data on catch per unit effort (CPUE) are widely used in management and stock assessment. As a result of diurnal migration, CPUE for shrimp at the Flemish cap is highly variable within the 24-hour period of the day. Size composition in the catch varies between day and night and also by depth. It is concluded that great care has to be taken when survey results are used to interpret the status of the stock.

Introduction

Data on catch per unit effort (CPUE) are widely used in management and stock assessment. At the Flemish Cap, CPUE data from surveys have been used to estimate the age/size composition of the stock and relative abundance from year to year in order to give advice on management of the stock. This study is to show the variability of the parameter and leads to the conclusion that great care has to be taken when survey results are used to interpret the status of the stock.

Materials and Methods

Data on shrimp were collected on board Icelandic and Estonian shrimp trawlers on several occasions in the period November 1995 - April 2000. The shrimps were measured to the nearest 0.1 mm, sorted into 0.5 mm length classes (OCL) and separated into sex categories, i.e. males, transitional, and females. Information on location, time of day, duration of, catch in and mean size (count) of shrimp in each tow was obtained from the trawler's logbooks.

Results

Generally, there were three hauls of 5-7 hours duration each day. The morning haul was from 03.00-12.00 local time, afternoon haul from 12.00-20.30 and the night haul until 03.00. Information from the logbooks was used to compute the effective trawling time, which varied from 61-81% of the time spent at sea, catch per unit effort (CPUE) in morning-, afternoon- and night hauls and the mean CPUE for each day. The results are shown in Table 1. The table covers 18 fishing trips of three different trawlers, A, B and C in the period January 1996 - August 1997. All were single trawlers. The average catch per unit effort is similar in the morning and afternoon but very much lower at night. The night CPUE is only 1/2 - 1/5 of the daytime values for the whole period.

A graph of the CPUE's by time is shown in Fig. 1. Note that the time intervals are not real scale.

In order to take a closer look at details in the CPUE, an example is taken from one particular fishing trip on trawler A 23/6 - 8/8 1997. The trawl was shot 107 times, 76 times during the day and 31 times during the night. Distribution of the CPUE night and day and locations of the hauls are shown in Fig. 2. The fishing took place on the SW, W and N part of the Cap. Two of the hauls were in the SE part. It often happens during practical fishing that nighttime is used to travel long distances to explore distant areas. Also, nighttime is often used for major trawl repairs, then loss of catch during repair or overhaul is minimized.

Figure 3 shows the CPUE in 45 consecutive tows from the trip, also the average weight (no/kg) of shrimp from each tow and the depth in meters. This is typical for the overall picture and is related to the distribution and behaviour of the shrimp at the Flemish Cap. CPUE is lower at night and shrimps are then smaller on the average. Shrimp move up from the bottom during the dark hours to feed on plankton, particularly the small shrimps. This is supported by the findings of Ivanova, who reported higher contents of planktonic food remains in the stomachs of males than in larger females.

Discussion

It is known that shrimps migrate up from the bottom during the night to feed on plankton and that small shrimp travel more than the larger ones. This is probably due to the fact that the volume-surface ratio makes it easier to "float" in open water and is therefore less energy consuming. The largest females probably sit on the bottom most of the time. Often, nearly all of the small shrimp disappear from the night catch, for again to show up in the catch during the daytime. It thus seems that they all migrate up to higher water layers but it is not known how large part of the population goes down again. Perhaps only part of the stock is fishable at all times?

As long this is not known, population estimates relying on CPUE must be used with great care. It seems to me that all stock estimates regarding shrimp are on the conservative side. Especially should short time assessments be used with care. Night sampling in areas with small shrimp will give misleading results.

Reference

Ivanova, I.V. 2000. About *Pandalus borealis* (Kroyer, 1848) nutrition on Flemish Cap. NAFO SSC. Doc. 00/65.

Table 1. Duration of fishing trips, effective trawling time in each trip, CPUE's at different times of the day in the period 1.1.1996 to 1.9.1997, by three shrimp trawlers at the Flemish Cap.

Wessel	Date m/year	Duration	Towing	Effective	Total	CPUE	CPUE	CPUE	CPUE
		of trip	time	towing time	Catch	Morning	Afternoon	Night	Average
		Days	Hours	%	Tons	kg/h	kg/h	kg/h	kg/h
D	01/1996	29	425	61	86	196	257	134	203
D	04/1996	21	368	75	101	181	229	67	162
B	04/1996	27	444	70	93	243	267	78	209
A	04/1996	27	401	61	83	208	250	76	207
B	05/1996	29	585	86	120	241	258	99	209
D	05/1996	27	501	77	146	327	410	122	292
A	05/1996	34	619	76	160	271	343	140	259
B	06/1996	28	572	85	114	256	284	51	199
B	07/1996	36	508	78	93	236	245	44	184
A	07/1996	35	667	78	147	282	299	57	221
B	08/1996	29	534	77	91	215	229	65	170
A	08/1996	27	401	61	83	208	250	76	207
D	08/1996	26	449	71	70	188	204	66	155
B	10/1996	23	430	78	55	142	160	76	127
B	04/1997	36	709	83	114	193	196	91	158
A	06/1997	33	602	77	134	246	245	128	211
A	07/1997	15	283	78	103	409	432	90	322
A	08/1997	21	381	77	94	290	329	70	243

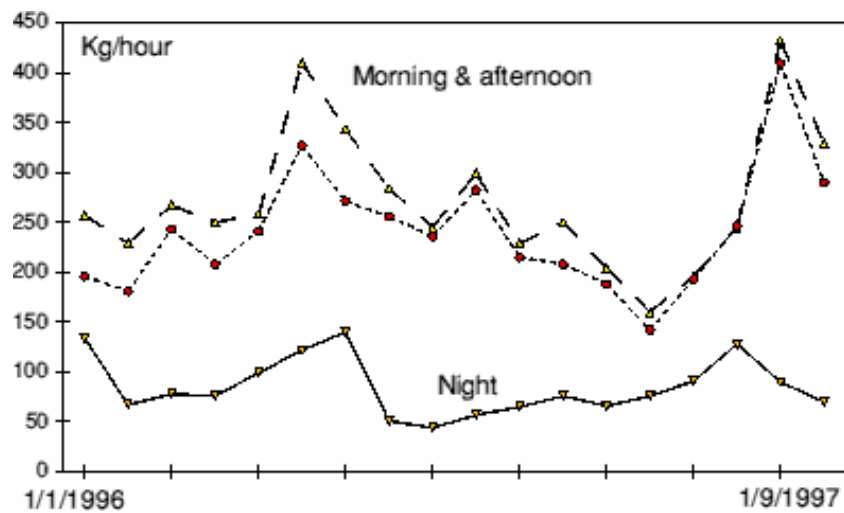


Figure 1. Plot of the CPUE data in morning- afternoon and night hauls from Table 1.

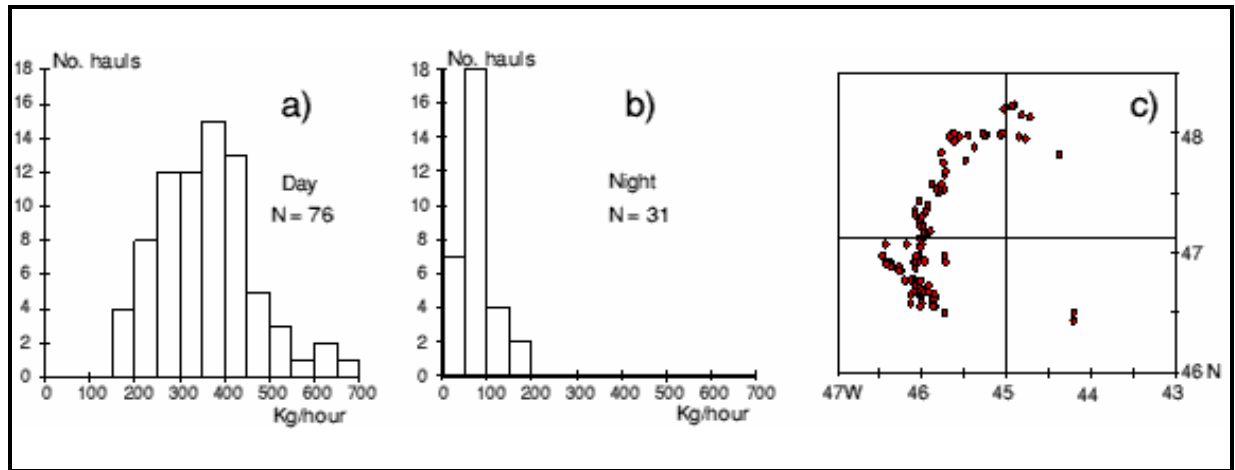


Figure 2. Distribution of CPUE in, a) day-hauls, and b) night-hauls. Location of all the hauls in the fishing trip by trawler A 23/6 - 8/8 1997 is also shown, c).

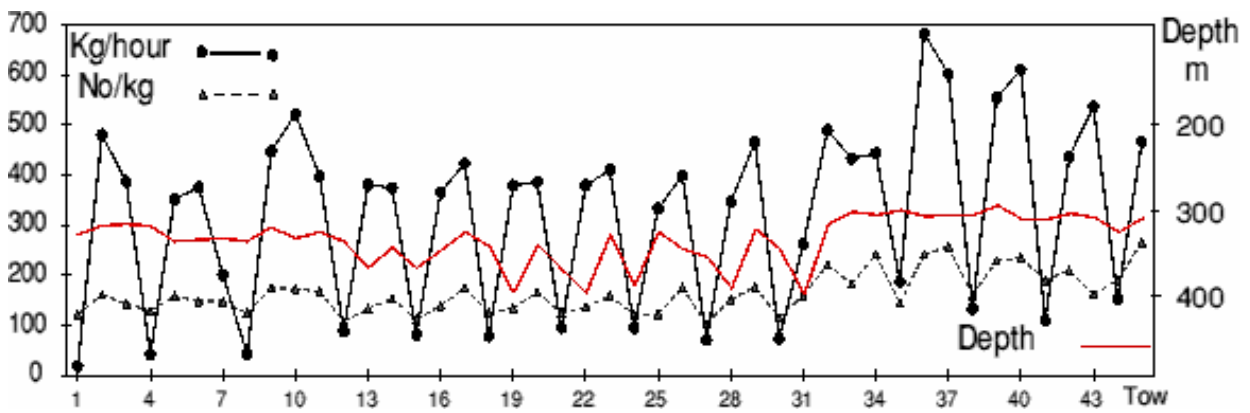


Figure 3. 45 consecutive tows from trawler's A trip 23/6 - 8/8 1997. Note the variation in CPUE; it is low during the night, high during the day. Size of shrimp varies by time of the day and by depth. Note that the depth perspective is from the surface to the bottom (scale is reversed).