Conch Fishery of Campeche

E. BAQUEIRO C., C. M. MEDINA M., and
H. RAMIREZ L.
Centro Regional de Investigacion Pesquera
Instituto Nacional de La Pesca
Apartado postal 587
Campeche, Camp. Cp. 24000
México

RESUMEN

Del análisis estadístico de las capturas comerciales en cuatro de las siete oficinas de pesca que registran capturas de caracol en el estado de Campehe. Se dan recomendaciones del esfuerzo y Captura por Unidad de Esfuenrzo (CPUE) ¢ptimos en base a los modelos de Shaefer y Fox.

PALABRAS CLAVE: Localidad, esfuerzo, CPUE, buzos.

ABSTRACT

Statistical analyses were conducted on catch per unit effort (CPUE) data for the conch fishery at four localities where catches are registered in the state of Campeche, Mexico. Optimal effort and CPUE are recommended based on Schaefer and Fox models.

KEY WORDS: Locality, effort, CPUE, divers.

Conch (Mollusca: Gastropoda) are fished as an alternative species by fishermen in Campeche with limited economical resources. They are harvested by hand during low tide or by free diving from small outboard boats. Production reached 708 metric tons in 1984, contributing 14% of national conch production. Conch are considered a marginal resource and little attention has been paid to the management and biology of the numerous species that contribute to the fishery in this region. Baqueiro and Castillo (1985) reported on the fishery identifying thirteen species which are commercially harvested. *Strombus costatus* brings the highest price while *Melongena melongena* and *M. corona* produce the largest catch. This work was based on official catch records and interviews of fishermen. A large percentage of the catch from Campeche and Carmen is not registered as it used for local consumption and restaurants. Production reported for Seybaplaya, Champoton, Sabancuy and Isla Aguada makes up 44% of the state's production, most of which is shipped out. Daily analyses of catch and effort are made for each locality to study the fishery and recommend limits for maximum sustainable yield.

Study Area

Campeche state is located on Yucatan peninsula between 20° 45' N 90° 25' W and 18° 37' N 92° 20' W (Figure 1), with 283 km of Gulf coastline. The coast, of Karstic origin, presents a low profile with few topographic accidents (Lankford, 1977). Sediments are dominated by carbonate sand and silt and fresh water runoff is primarily underground with abundant coastal wellings.

The coast can be divided into three regions; 1) Terminos lagoon located on the southwest of the state, marking the limits for a physiographic region of alluvial plains from the Grijalva and Usumasinta rivers system; 2) the central part from Isla Aguada to Campeche with sandy beaches and extensive intertidal flats of *Thalassia* and *Syringodium*, with Champton River draining the central savannas of the state, along with some short drain canals, both with mangrove bordering vegetation; and 3) the Northern region from Campeche to the limits of Yucatan state which is characterized by a very extensive intertidal mangrove swamp area of low profile with abundant underground fresh water wellings.

The climate is tropical with an average summer rain of 1057.6 mm a year and evaporation of 725 mm. There is a limited winter rain of 5,4% of the total. The average temperature is of 26.5°C with a fluctuation of ± 6.3°C (Garcia, 1981).

MATERIALS AND METHODS

Information on catch, number of boats and fishermen per boat was reported to the fisheries offices of Seybaplaya, Champoton, Sabancuy and Isla Aguada. The information on number of fishermen per boat did not coincide with the numbers actually observed so the effort is counted as trips per boat. Days that went unreported were extrapolated from the monthly average. Data are presented on frequency histograms for analysis. Schaefer and Fox models were used to estimate optimal catch, effort and catch per unit of effort (CPUE)) (Cushing, 1983). Complimentary information was obtained from fishermen, frequent checks of landings on the beach and from recent shell piles.

The Fishery

Whole families, women, children and elderly men contribute to this artisanal fishery. All varieties of conchs of over 5 cm in length are harvested at low tide. *Melongena* spp., *Strombus pugilis* and *Fasciolaria* spp. are among the most frequently harvested. The soft parts are extracted by boiling the whole animal in seawater and removing the opercula and viscera. They are iced and sold fresh.

Larger specimens are harvested by free divers. Five to eight young divers go out in 20 to 25 foot (6 to 8 m), outboard boats for four to six hour trips. Most free diving is up to six meters deep. The shells are usually broken or a hole is struck into the shell posterodorsaly through the third whorl of the spire, cutting

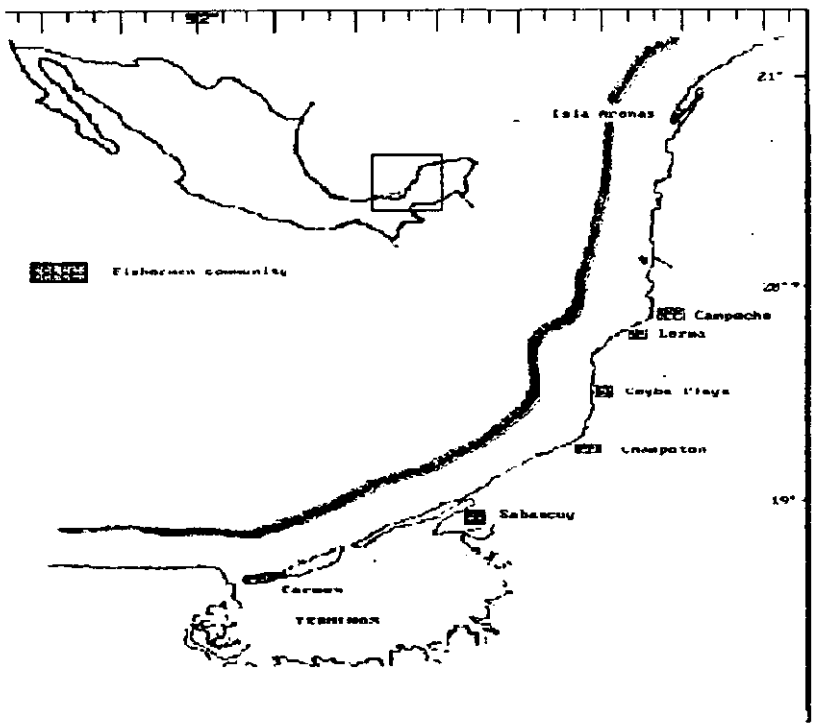

Figure 1. Map of the state of Campeche, México with fishery offices where conch production is registered.

the retractor muscle off the columella to extract the meat. This operation is done either on the boat during the trip back or at their arrival at the beach.

Eighteen species are utilized by the fishery (Table 1), of which *Strombus costatus*, *Pleuroploca gigantea* and *Turbinella angulata* are preferred. *Strombus pugilis* is primarily captured at low tide, though it is very abundant on sandy bottoms from 3 to 12 meters deep.

Annual production from the Pacific, Gulf and Caribbean coasts and the state of Campeche for the years 1980 - 1988 are shown in Table 2.

RESULTS AND DISCUSSION

The state of Campeche has seven fishery offices where conch catches are registered, Figure 2 shows the percentage per office or locality. Ciudad del Carmen and Campeche were not included because a very large, undetermined amount is not registered, though they contribute 54 % of state's production. Forty four percent of production is caught at Seybaplaya, Champoton, Sabancuy and Isla Aguada.

Table 3 shows total annual production, effort (number of trips) and CPUE per locality. Figures 4 through 7 show monthly production averages, effort and mean CPUE. Table 4 represents calculated average optimal catch, effort and CPUE.

Production increased from 1980 to 1984, when it reached 700 metric tons, dropping to under 500 metric tons in 1985 and averaging 700 metric tons since 1988 (Figure 3).

At Sabancuy and Isla Aguada where a longer record is available, an increasing tendency can be detected from 1980, until 1989 at Sabancuy, and until 1985 at Isla Aguada (Table 3). At Seybaplaya and Champoton the largest catch was registered for 1984 at Seybaplaya and 1985 at Champoton, dropping there until after 1989 when a slight recovery can be detected at all localities except Seybaplaya. There is a very clear relationship between fluctuating effort and production at Seybaplaya, Champoton and Isla Aguada, although in 1986 very large increase in effort yielded a low CPUE and a drop in production, while at Sabancuy the effort decreased while production increased.

Of the four localities the lowest monthly effort was applied at Sabancuy (Figure 6) with the higher effort applied during July and December, while the highest monthly effort was registered for Isla Aguada with peaks during June and December. At both localities effort is kept constant through the year, while at Seybaplaya and Champoton (Figures 4 and 5) it increases gradually from a minimum in November reaching a maximum in June.

The Catch Per Unit of Effort (CPUE) appears different at each locality. The highest was registered at Seybaplaya (Figure 4) where 140 kg/trip were attained in October with an effort of 100 trips. The second highest CPUE of 90 Kg per trip was reported at Sabancuy during January with an effort of nineteen trips

Table 1. Commercial species of gastropods form the coast of Campeche, Mexico.

COMMON NAMES	SCIENTIFIC NAMES
Lanceta	*Strombus costatus*
Chivita	*S. pugilis*
	S. alatus
	S. raninus
	S. gallus
Molon	*Melongena melongena*
	M. corona
Sacabocado	*Busycon carica*
	B. candelabrum
	B. coarctatum
	B. contrarium
	B. perversum
	B. canaliculatum
	B. spiratum
Trompillo o	*Fasciolaria tulipa*
Campechana	*F. lilium*
Rojo o Chacpel	*Pleuroploca gigantea*
Rojo	*Charonia variegata*
Caracol negro	*Xancua angulata*

(Figure 6). There was an increasing catch from January to May at Champoton parallel to the increase in effort and a very high CPUE in December and January when a very low effort was reported (Figure 5). CPUE is constant throughout the year at Isla Aguada independent of the effort applied (Figure 7).

At Seybaplaya and Champoton (Figures 4 and 5) landings increased with increasing effort from January to May-June, decreasing thereafter until October at Seybaplaya, and December at Champoton when a very large catch was reported though a very reduced effort was applied. Sabancuy and Isla Aguada (Figures 6 and 7) also show an increasing CPUE from January to June, but production remains close to the average throughout the year.

CONCLUSION

Optimum catch, effort and CPUE as estimated by Schaefer and Fox models (Table 4) suggest that effort could be increased at all localities except for Sabancuy where a slight increase in effort produced a minimum reduction on CPUE. The data indicate that when a maximum effort is reached (1570 trips at Seybaplaya, 1878 trips at Champoton and 7512 trips at Isla Aguada) production drops the following seasons. At Sabancuy, CPUE decreases with increasing

Table 2. Mexican conch production, Metric tons and percentage for the Pacific, Gulf and Caribbean and Campeche state coasts.

	1980 - %	1981 - %	1982 - %	1983 - %	1984 - %	1985 - %	1986 - %	1987 - %	1988 - %
TOTAL	3856 - 100	4778 - 100	6648 - 100	5109 - 100	5926 - 100	5693 - 100	5229 - 100	5119 - 100	5185 - 100
Pacific	1503 - 39	1578 - 33	2401 - 36	2660 - 52	1391 - 23	2503 - 44	2694 - 52	2671 - 52	2812 - 54
Gulf & Car.	2353 - 61	3200 - 67	4247 - 64	2449 - 48	4535 - 77	3190 - 56	2535 - 48	2448 - 48	2373 - 46
Campeche	239 - 6	335 - 7	420 - 6	426 - 8	685 - 12	471 - 8	592 - 11	513 - 10	708 - 14

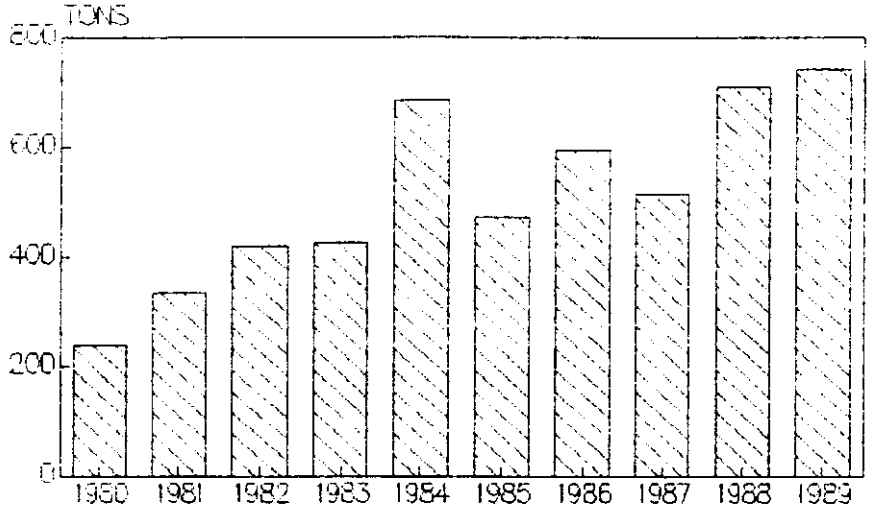

Figure 2. Percentage of state production by locality.

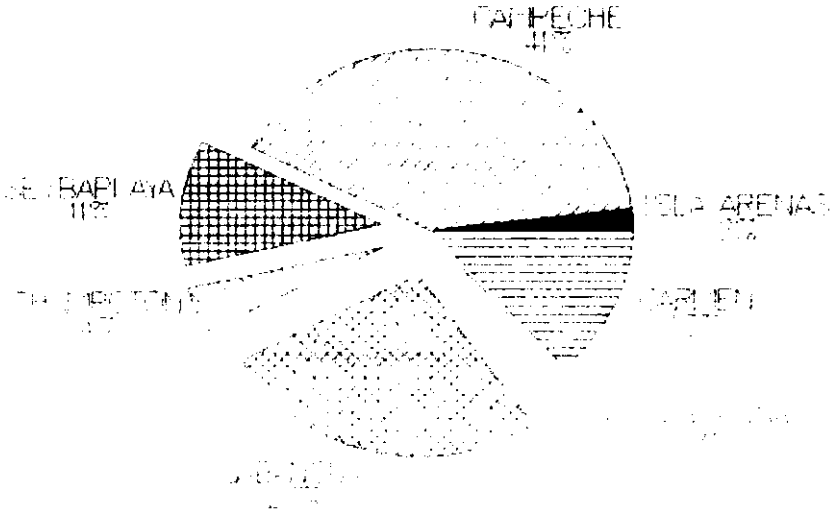

Figure 3. Annual Conch production. Campeche, Mexico 1980-1988

Table 3. Annual production, effort and CPUE per locality.

	Playa			Champoton			Sabancuy			Isla Aguada								
	Capture			Effort			CPUE			Capture			Effort			CPUE		
1980													111	63	2			
1891													9434	264	36	27355	1485	18
1982													1283	104	12	14800	253	58
1983													11399	1253	9	12539	4722	3
1984	133458	1570	85										40251	984	41	21434	6091	4
1985	89136	1391	64	68930	1878	37							66511	428	155	26046	1678	16
1986	39749	961	41	24910	1188	21							208586	473	441	14509	7512	2
1987	63036	468	135	10806	904	12							208586	129	1617	1993	29	68
1988	99282	591	168	3577	719	5							443746	198	2241	1798	522	3

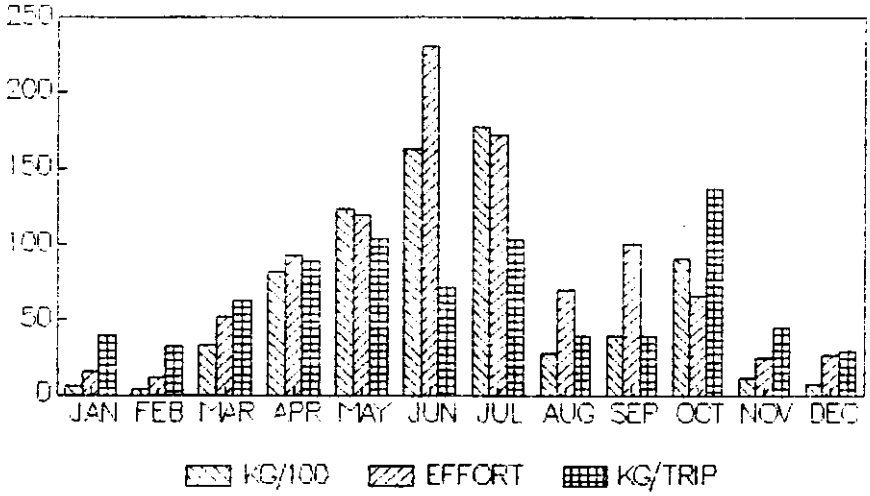

Figure 4. Monthly catch, effort and CPUE. Seybaplaya, Campeche 1984-1989.

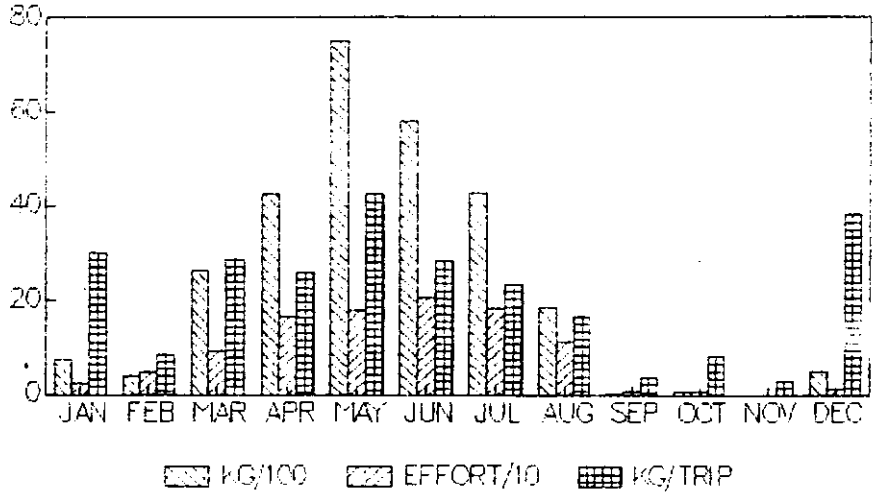

Figure 5. Monthly catch, effort and CPUE. Champoton, Campeche 1984-1989.

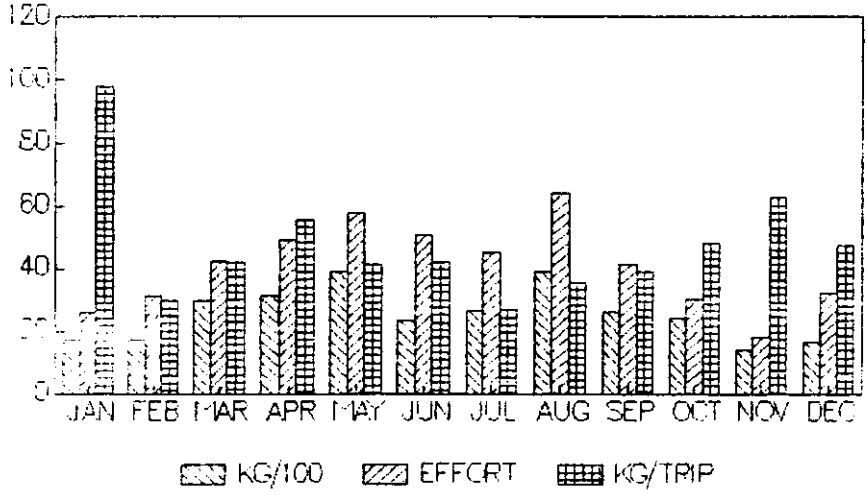

Figure 6. Monthly catch, effort and CPUE. Sabancuy, Campeche 1984-1989.

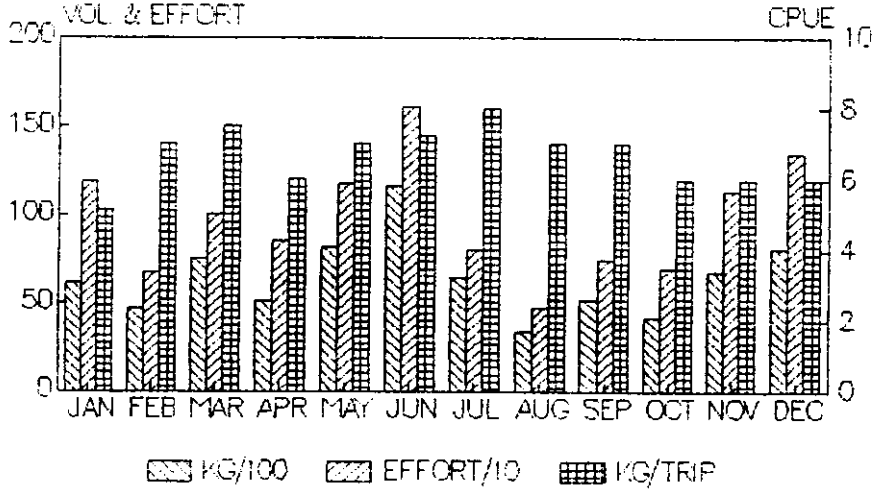

Figure 7. Monthly catch, effort and CPUE. Champoton, Isla Aguada 1984-1989.

Table 4. Annul average and estimated Catch, Effort and CPUE of Conch from Campeche, Mexico.

CATCH	AVERAGE	SHAEFER	FOX
SEYBA	76256	109056	110550
CHAMPOTON	28335	136859	161558
SABANCUY	184189	44030	39061
ISLA AGUA	12968	722295	38256
TOTAL	301748	1012240	349425
MEAN	75437	253060	87356
EFFORT	**AVERAGE**	**SHAEFER**	**FOX**
SEYBA	2170	1506	2450
CHAMPOTON	1108	8049	16642
SABANCUY	436	1080	2083
ISLA AGUA	2295	3260	3458
TOTAL	6009	13895	24633
MEAN	1502	3473.75	6158.25
CPUE	**AVERAGE**	**SHAEFER**	**FOX**
SEYBA	87.76	72.39	45.11
CHAMPOTON	29.66	17.00	9.70
SABANCUY	65.05	40.73	18.36
ISLA AGUA	19.55	15.08	6.10
TOTAL	202.02	145.20	79.27
MEAN	50.50	36.30	19.82

effort, although production showed an increase until 1989. Optimum catch for Sabancuy is underestimated by the models, though the effort seems realistic.

It is evident that above a certain effort the populations are affected and a reduction in catch is seen in the following season with CPUE decreasing as effort increases. This directly affects the economy of fishermen who make their living from diving. A strict regulation of effort should be followed not exceeding the number of trips proposed in Table 5, with control on the number of divers per boat. Given actual price for conch meat at Campeche, these figures allow for an income of two to three times the minimum wage per fisherman.

Table 5. Proposed maximum effort for the conch fishery of Campeche, Mexico.

Locality	Effort (trips)	CPUE (kg/trip)	Divers Per Boat
Seybaplaya	1506	72	5
Champoton	8049	17	2

These recommended catches add up to an annual catch for the four localities of 337.365 tons which representing the 46% of states catch, it would be expected to have an estimated catch of 733.4 tons which is a little below the catches registered for 1989.

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