

The biomass of *H. triarthrus* was nearly 900 tonnes, or 60% of the biomass of commercial species.

Other deep water crustaceans

The lobster, *Palinurus delagoa*, was caught south of 19°00'S, between 260 and 410 m depth. The highest catch rate was 13, 8 and 6 kg/h, while the mean catch rate for Banco de Sofala was 0.7 kg/h. Mean total length was 23,3 cm. Crayfish, *Nephropsis stewarti* and *Metanephrops andamanicus*, were distributed in the whole area, with *Nephropsis stewarti* as the most abundant in the deeper depth range. The mean catch rate of the two species was at the same level as lobster, with 2 kg/h as maximum catch rate.

Estimated biomass of lobster and crayfish was 650 tonnes, of which 75% was calculated for 200-500 m depth range.

4.2 BAZARUTO TO PONTA DO OURO

The distributions of deep water shrimp in general and *Haliporoides triarthrus*, south of 21°00'S, are shown in Figure 10 and Figure 11.

Bazaruto-A

Table 5 gives a summary on catches by selected groups.

Shrimp

The best catches of shrimp, 40, 36 and 34 kg/h, were taken in the depth range 400-600 m. "Shrimp", however, includes all species of shrimp, with the small, non-commercial species - *Plesionika martii* making about 25% of the catches. Of the commercial species, *Haliporoides triarthrus* and *Penaeopsis balssi* were the two most important (Table 6). Maximum catch rates 32, 27 and 17 kg/h (mean 7 kg/h) and 34, 24 and 18 kg/h (mean 3 kg/h), were caught in 500 and 400 m depth range, respectively.

Table 7 gives the estimated biomass of the most important shrimp species, with *H. triarthrus* and *P. balssi* making more than 90% of the biomass.

Other deep water crustacean

Other deep water crustacean occurred in small quantities. The lobster *Palinurus delagoae* was caught at a few localities between 21° and 22°S, in the depth range 300-400 m. The catch rates were 1.3-2.5 kg/h, with a mean of 1.5 kg/h. Crayfish was represented by two species, - *Metanephrops andamanicus* and *Nephropsis stewarti*. A few specimens of *Geryon quinquedens*, the deep water red crab, were caught between 400-700 m depth.

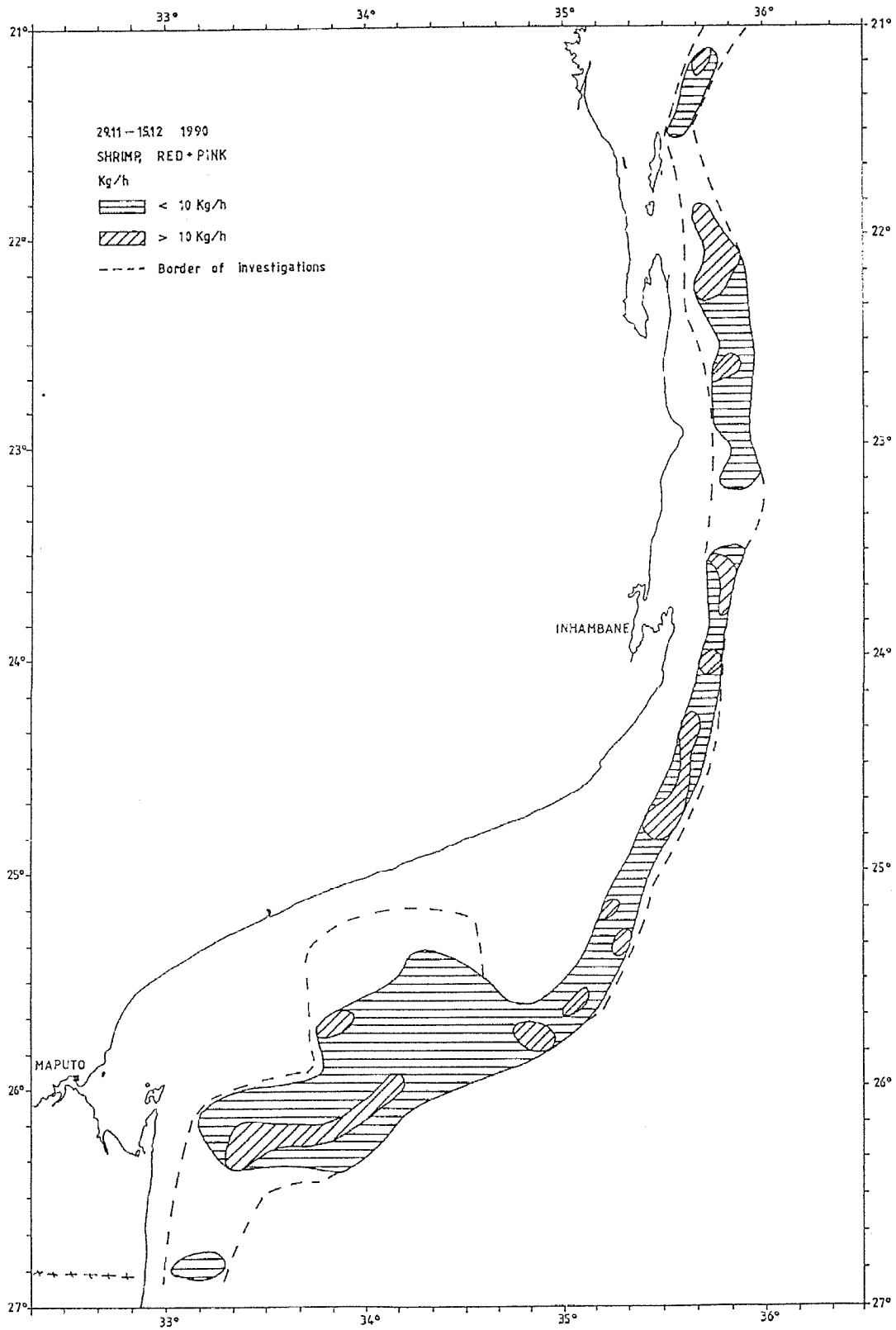


Figure 10. Distribution of commercial shrimps, Bazaruto to Ponta do Ouro.
Density strata based on catch rates (kg/h).

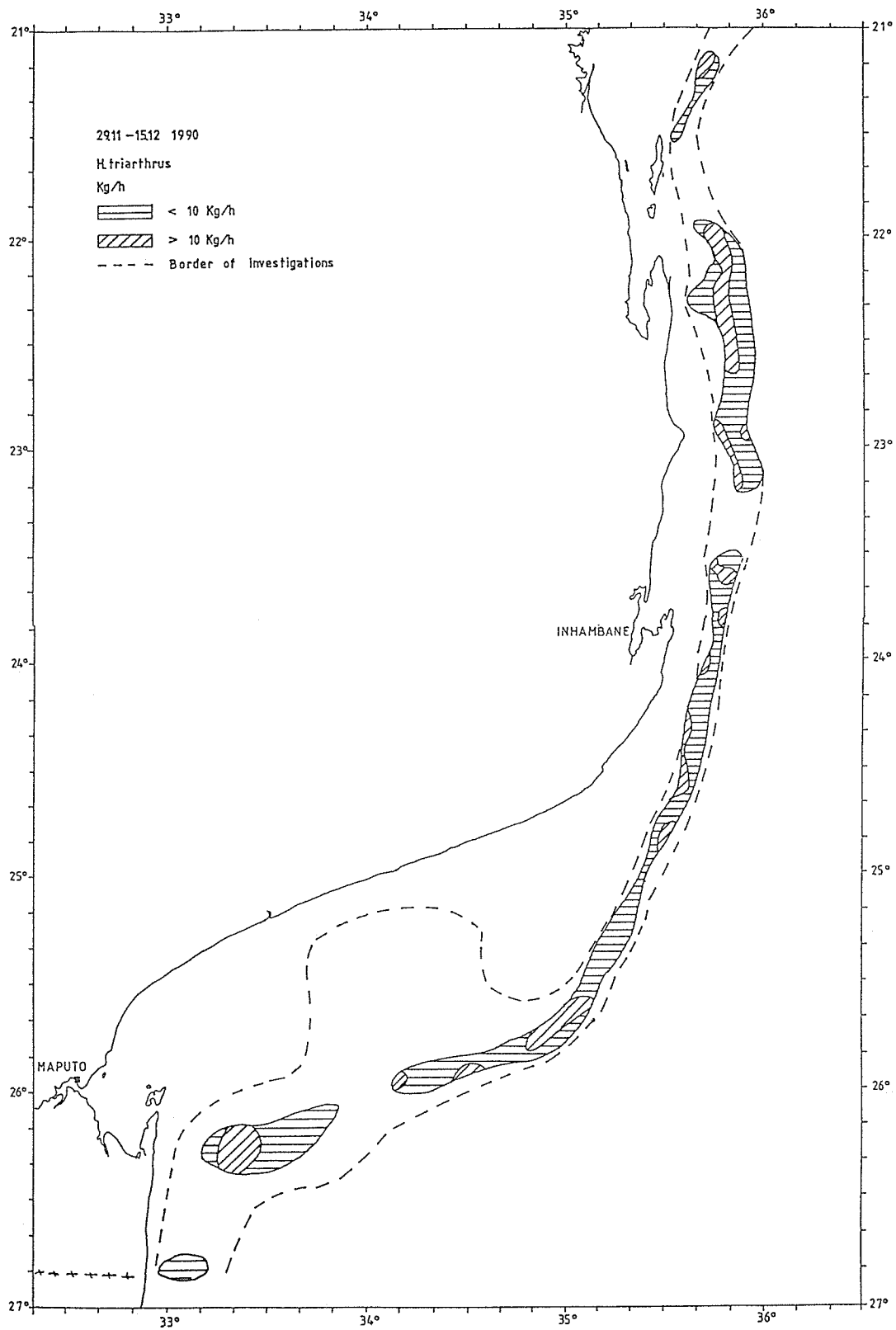


Figure 11. Distribution of *Haliporoides triarthrus*, Bazaruto to Ponta do Ouro. Density strata based on catch rates (kg/h).

Table 5. Bazaruto-A. Catch rates per main groups in bottom trawl hauls, in kg/h.

ST.NO.	DEP.	SHRIMP	LOBSTER	CRAYFISH	SQUIDS	SHARKS	FISHES
213	630	3.34		5.10	0.16		26.02
214	533	31.12			0.80	0.24	85.64
215	472	6.00		0.08	9.00	7.40	78.44
216	418	22.93		0.33	13.28	4.50	33.84
217	363	9.03	1.26	0.42	147.00	10.50	58.20
218	572	16.83		0.15	4.68	0.96	49.35
219	444	2.77		0.34	1.57		88.39
220	390	0.27	2.00	0.24	182.93	40.00	720.53
221	317		2.45		8.80	15.50	87.55
222	375	0.63	2.46	0.93	34.09	66.78	80.01
223	432	11.17		0.90	12.18	9.00	132.96
224	501	11.03		0.05	3.49	7.64	55.75
225	541	39.95		0.45	2.75	5.15	168.30
226	586	30.53		2.05	1.66	1.00	25.43
227	402	13.75			4.73	94.90	342.55
228	459	29.70			6.50		290.00
229	513	9.60			5.52	4.44	159.84
230	550	19.98		0.12	1.32	2.22	161.68
231	598	27.04		0.32	4.70	41.85	71.92
232	647	18.53		5.40	0.36	6.63	18.11
233	701	32.82		1.14	15.60	50.00	34.26
234	711	11.37		2.10	0.30		22.41
235	651	14.20		2.30	0.25	35.39	37.95
236	604	20.81		0.16	0.40	11.33	56.28
237	555	30.30			0.60	1.08	35.76
238	493	8.61			1.68		81.60
239	438	17.50			4.83	20.30	183.75
240	405	8.73			0.75		82.35
241	368	0.48			0.80		222.40
242	406	11.80			74.00		625.80
243	483	13.72			0.85		64.18
244	522	17.12			2.54		95.36
245	571	5.40		0.35	0.15	0.30	100.60
246	619	10.80		5.52	0.60	0.24	31.74
247	676	9.36		0.36		0.42	12.72
248	677	11.10		0.36	0.87	0.18	25.65
249	612	12.51		5.70	0.99	1.65	38.01
250	563	21.90		0.78	0.18	9.30	119.04
251	511	12.69		0.09			80.79
252	467	2.07		0.03	3.09		89.04
253	393	5.50			11.25		100.20
254	421	34.20			2.52		202.68
255	355	4.40				10.16	79.28
256	406	12.75					127.95
257	461	9.06			0.09	1.05	85.77
258	506	35.88			3.78	8.42	68.12
259	573	10.50			2.12	2.80	32.96
260	603	5.60			0.40		25.80
MEAN		14.49	0.17	0.75	11.96	9.80	114.50

Table 6. Bazaruto-A. Catch rates of commercial important shrimp species, in kg/h.

ST.NO.	DEP.	H.triathr.	A.foliacea	A.antenna.	P.balssi	P.martia	Other
213	630	3.04	0.20				36.44
214	533	15.52				15.60	86.68
215	472	4.60				1.40	94.92
216	418	14.35			8.23		51.30
217	363				9.03		217.38
218	572	9.48	0.15			6.96	55.74
219	444	0.10			2.67		90.30
220	390				0.27		948.37
221	317						114.30
222	375				0.63		184.27
223	432	1.51			8.76	0.90	155.04
224	501	1.68			0.58	7.27	68.80
225	541	17.15				22.50	178.30
226	586	16.63				12.95	32.67
227	402				13.75		442.84
228	459	5.30			24.40		297.74
229	513	8.04				1.56	170.70
230	550	11.82				6.00	168.58
231	598	17.12				8.92	121.99
232	647	11.08	0.53	0.53		5.60	33.94
233	701	3.90	9.60	2.40		16.92	129.62
234	711	2.55	1.29	1.50		5.85	45.69
235	651	5.00	0.20	0.25		7.00	107.74
236	604	14.29	0.12			4.40	87.93
237	555	27.33				2.88	39.78
238	493	5.88			0.09	2.64	83.28
239	438				17.50		208.88
240	405				8.70		83.19
241	368				0.24		224.08
242	406				11.80		699.80
243	483	13.12			0.05	0.50	65.13
244	522	14.00				3.04	103.74
245	571	2.75				2.50	109.45
246	619	4.80	2.76	0.54		2.40	85.26
247	676	3.36	0.18	1.50		4.14	57.90
248	677	4.35	0.90	1.05		4.20	47.94
249	612	5.16	0.33	0.54		6.00	52.68
250	563	16.86				4.50	132.84
251	511	10.80				1.86	81.96
252	467	0.21			1.86		92.22
253	393				5.50		112.20
254	421				34.20		205.20
255	355	1.40			3.00		89.44
256	406	10.75			1.25		130.95
257	461	4.32			0.03	3.78	88.20
258	506	32.40	0.52			2.80	81.64
259	573	2.56	5.50			2.00	40.96
260	603	3.24	0.20	0.12		2.00	50.32
MEAN		6.80	0.47	0.18	3.18	3.52	143.51

Total number of stations : 48

Table 7. Biomass of deep water shrimp along the slope of Bazaruto-A, estimated from density by depth strata (in tonnes).

Depth (m)	200-400	400-500	500-600	600-700	Total
Area (km ²)	2072	1036	1032	1100	5240
<u>H. triarthrus</u>	6	36	127	52	221
<u>P. balssi</u>	49	76	-	-	125
<u>A. antennatus</u>	-	-	-	6	6
<u>A. foliacea</u>	-	-	3	13	16
<u>H. tricarinatus</u>	-	-	3	6	9
Total	55	112	133	77	377

Bazaruto-B

Compositions of selected groupings in the catches, are given in Table 8.

Table 8. Bazaruto-B. Catch rates per main groups in bottom trawl hauls, in kg/h.

ST.NO.	DEP.	SHRIMP	LOBSTER	CRAYFISH	SQUIDS	SHARKS	FISHES
261	665	10.68		0.09	5.82		24.96
262	566	7.25		0.90	1.13	0.90	13.17
263	458	42.84				4.00	37.48
264	372	5.52	2.48		13.76		217.69
265	645	4.12		0.05	1.97	0.59	18.81
266	552	7.00			1.52	0.36	39.34
268	458	33.24			3.80	1.28	71.72
269	373	2.40			6.40	2.48	183.20
270	267				4.56	0.84	45.44
271	504	84.50			4.62		89.32
272	537	27.03			1.62	19.27	99.16
273	593	6.66			0.60	5.30	29.37
274	636	3.30		0.08	0.03	2.53	5.90
275	614	4.84			0.34	1.90	3.18
276	567	2.71			0.53	2.21	6.36
277	468	21.45			3.72		43.95
278	416	3.50	0.16		5.60	3.90	68.05
279	324	1.30			18.84	20.87	157.72
280	465	12.91	0.15		8.68	45.64	163.76
281	569	28.49			2.59	24.28	24.29
282	666	19.08		2.76	0.48	56.00	48.54
283	720	11.84		0.04		2.52	48.16
284	619	63.90				0.82	24.98
285	513	45.12			12.96	10.64	136.80
286	416	48.78			45.00	59.30	138.06
MEAN		19.94	0.11	0.16	5.78	10.63	69.58

Shrimp

Shrimp was caught with an average catch rate of 20 kg/h of which *H. triarthrus* made 50% (Table 9). Highest catch rates were 81, 41 and 32 kg/h. *Plesiopenaeus edwardsianus* were taken at a few localities at 600-700 m depth, with a maximum rate of 56 kg/h.

Penaeopsis balssi was distributed down to 500 m. Except for one good catch of 49 kg/h, only small quantities were taken; mean catch rate 2.3 kg/h.

Aristeus antennatus and *Aristeomorpha foliacea* had maximum catch rates of 5 and 3 kg/h, respectively.

Table 10 gives the estimated abundance of the commercially most important shrimps along Bazaruto-B. *H. triarthrus* and *P. balssi* made more than 70% of the total biomass. The biomass per depth range shows that 400-500 m depth range has nearly 50% of the total biomass.

Table 9. Bazaruto-B. Catch rates of commercial important shrimp species, in kg/h.

ST.NO.	DEP.	H.triathr.	P.edwards.	P.balssi	A.antenna.	A.foliacea	Other
261	665	0.54			5.10	1.44	47.52
262	566	5.10			0.85	0.40	19.14
263	458	40.80					47.68
264	372			5.52			237.93
265	645	1.00			0.23	1.04	24.96
266	552	5.80					43.82
268	458	31.92		0.24			78.04
269	373	2.00		0.32			222.24
270	267						53.14
271	504	81.00					100.38
272	537	15.03					132.68
273	593	3.00			0.27	3.09	48.70
274	636	0.65			1.45	1.02	14.14
275	614	0.70	0.88		1.84	0.82	16.68
276	567	1.80			0.03	0.11	16.07
277	468	15.18		0.09			59.49
278	416			3.25			112.56
279	324			1.30			205.23
280	465	5.67		0.28			227.64
281	569	22.05			0.21	0.35	101.91
282	666	1.08	17.64		0.18	0.12	134.90
283	720	0.16	7.88		1.20	0.16	58.36
284	619	1.35	56.25		2.25	1.80	33.06
285	513	28.32		0.64			181.20
286	416			48.78			250.46
MEAN		10.53	3.31	2.42	0.54	0.41	98.72

Table 10. Biomass of deep water shrimp along the slope of Bazaruto-B, estimated from density by depth strata (in tonnes).

Depth (m)	200-400	400-500	500-600	600-700	Total
Area (km ²)	2200	1360	830	1100	5490
<u>H. triarthrus</u>	13	196	122	19	350
<u>P. balssi</u>	32	140	-	-	172
<u>A. antennatus</u>	-	-	2	19	21
<u>A. foliacea</u>	-	-	6	10	16
<u>H. tricarinatus</u>	-	-	-	6	6
<u>P. edwardsianus</u>	-	-	-	149	149
Total	45	336	130	203	714

Other deep water crustaceans

Small catches of lobster (*P. delagoa*) and crayfish (*N. stewarti*) were taken, with mean rates 2 kg/h.

Boa Paz

The catch compositions per main groups, are given in Table 11.

Shrimp

The three highest catch rates of the shrimp-group, were 103,76 and 70 kg/h, and a mean catch rate of 16 kg/h. Commercial species made 73% of the total shrimp catch, with *H. triarthrus* as the most important species (Table 12). Its mean catch rate was about 10 kg/h. *H. triarthrus* was caught deeper than 500 m, with maximum mean catch rate (31 kg/h) in 500-600 m depth range. The best catch rates were 76, 68 and 66 kg/h

Table 11. Boa Paz. Catch rates per main groups in bottom trawl hauls, in kg/h.

ST.NO.	DEP.	SHRIMP	LOBSTER	CRAYFISH	SQUIDS	SHARKS	FISHES
287	481	20.40	1.52		4.20	12.80	132.66
288	521	102.69	0.09		19.71	5.85	151.56
289	570	38.25	0.18		19.35	50.77	48.68
290	622	1.77	1.20	4.35	2.94	20.00	57.65
291	573	63.76			0.77	1.54	85.60
292	519	36.15			3.60	11.50	91.55
293	465	17.60	1.92		9.40		598.60
294	420	3.00	0.15		15.00	15.00	283.80
296	571	27.88	0.06		13.00	54.00	19.60
297	522	12.89			0.84	15.00	30.61
298	472	26.04	0.50		0.28	5.00	130.55
299	403	1.53			1.11		67.17
300	371	0.40			1.65	0.30	142.95
301	419	7.98	0.52		24.50	1.26	424.02
302	470	13.23	2.18		16.24		143.18
303	519	9.44			1.80	2.36	106.52
304	567	15.84		0.06	1.05		53.70
305	625	17.20		3.40	2.24		141.36
306	572	76.14			0.96		70.44
307	517	1.54			0.08	1.63	12.92
308	476	15.15			0.24		55.32
309	418	6.76	0.30		0.20	1.96	35.88
310	374	3.45	0.37		1.44		87.75
311	420	6.52			1.16	0.08	112.40
312	470	9.30			1.02		167.16
313	520	21.46			0.36		32.92
314	577	70.10	0.10	0.58	0.98		18.13
315	623	21.85	0.15	0.50	0.25		63.30
316	673	6.30		1.80	1.20		46.50
324	364	1.86	5.89	1.36	0.12	11.10	43.89
332	372	4.84	0.04	5.36	0.20	1.60	39.44
333	321	1.64	4.35	0.10	2.40	19.45	42.88
334	272	0.40	12.00		19.60		490.80
335	291		0.20		18.25	8.25	123.05
336	356	0.06		7.95	10.59	3.30	71.28
337	369			2.20	5.80	0.12	48.58
338	335	0.08	1.34	0.62	7.88	0.38	68.93
339	238	0.64			5.96		98.16
340	259	1.74			0.25	1.96	7.86
341	372	5.50	0.74	2.55	0.40	1.80	37.46
347	370	1.64	3.33	1.03	3.03	3.05	56.71
MEAN		16.42	0.91	0.78	5.37	6.14	110.77

Mean catch rates of *P. balssi*, *A. antennatus* and *A. foliacea* were low, 2 kg/h. Highest catches of *P. balssi*, 13 to 15 kg/h, were taken at 460-470 m depth.

Table 13 gives the biomass estimates of important deep water shrimps in Boa Paz area. The levels are the same as those found in Bazaruto-B, with the biomass of *H. triarthrus* and *P. balssi* about 100% higher than in the two northern areas.

Table 12. Boa Paz. Catch rates of commercial important shrimp species, in kg/h.

ST.NO.	DEP.	H.triathr.	A.foliacea	A.antenna.	P.balssi	P.martia	Other
287	481				6.78	13.32	153.56
288	521	75.60				27.00	178.56
289	570	20.07	1.98	4.32		11.70	129.06
290	622	0.15	0.24	0.09		0.03	92.95
291	573	57.75	2.48	0.72		2.75	91.27
292	519	27.50	0.65			8.00	116.80
293	465				14.60	3.00	635.52
294	421				3.00		328.95
296	571	21.08	2.00	1.70		3.08	87.72
297	522	1.98	1.25	0.26		9.14	51.71
298	472		0.42		0.84	24.57	153.55
299	403				0.75	0.30	75.21
300	371				0.20		158.75
301	419				7.98		461.36
302	470	0.14			12.67		185.47
303	519					9.40	115.20
304	567	9.75	0.06			6.00	56.26
305	625	6.40	0.16	0.16		7.20	171.88
306	572	66.00	1.08			9.06	77.16
307	517	1.00				0.52	16.32
308	476	0.12			0.27	12.90	71.22
309	418	0.04			6.12	0.04	45.78
310	374				2.25		92.86
311	420				3.52	2.20	115.80
312	470					9.24	176.46
313	520	20.00	0.40			1.06	33.48
314	577	68.10	1.00			1.00	21.35
315	623	19.00	0.10	0.75		0.45	80.75
316	673	1.80	0.60	3.00		0.30	84.90
324	364				1.50		62.72
332	372					0.20	51.48
333	321						72.22
334	272						541.80
335	291						149.75
336	356				0.06		93.12
337	369						56.70
338	335				0.08		79.15
339	238						105.96
340	259						12.00
341	372						48.85
347	370						68.99
MEAN		9.67	0.30	0.27	1.48	3.96	131.77

Total number of stations : 41

Depth (m)	200-400	400-500	500-600	600-700	Total
Area (km ²)	3036	3543	1160	500	8239
<i>H. triarthrus</i>	-	-	351	53	404
<i>P. balssi</i>	9	177	-	-	186
<i>A. antennatus</i>	-	-	7	7	14
<i>A. foliacea</i>	-	-	10	1	11
Total	9	177	368	61	615

Highest abundance was estimated for the depth range 500-600 m, having 60% of the calculated biomass.

Other deep water crustaceans

Panulirus delagoae was caught at between 320 and 480 m depth, with maximum catch rate, 6 kg/h, at 360 m. Mean catch rate was 0.5 kg/h. The two species of crayfish, *M. andamanicus* and *N. stewarti*, occurred in small quantities, mean catch rate of both was 0.5 kg/h. Best catches of *M. andamanicus* were 3-8 kg/h.

Abundance of lobster was estimated to about 200 tonnes.

Inhaca

Catch rates of the main groups caught in Inhaca area, are given in Table 14.

Table 14. Inhaca. Catch rates per main groups in bottom trawl hauls, in kg/h.

ST.NO.	DEP.	SHRIMP	LOBSTER	CRAYFISH	SQUIDS	SHARKS	FISHES
317	323				3.66	45.24	164.28
318	371	8.26	0.22		0.86	68.57	51.17
319	420	19.81	0.32		0.49		192.36
320	471	113.60			0.32	10.80	109.68
321	524	42.75			0.08		26.71
322	574	61.28			0.66		83.76
323	616	14.81	0.18	0.32	3.43	1.90	73.41
325	423	5.01	0.62	0.63	2.16		76.26
326	478	23.28	0.30		0.50	3.30	36.80
327	521	9.22			0.76	3.40	40.34
328	563	56.64			1.20		59.64
329	521	24.80	0.60		10.32	4.96	66.48
330	471	8.67	0.69		0.16		25.27
331	419	7.60	0.36	0.36	0.10		50.94
342	418	7.20	0.60		0.40		111.88
343	616	22.98			9.36		123.18
344	550	10.20			4.00		99.38
345	466	6.72	0.24		5.64	2.40	199.20
346	421	21.70	0.16	2.06	10.15		165.34
348	674	9.95			12.30	6.95	102.55
349	612	8.53			0.70		72.78
350	562	95.55	0.16		10.27	2.99	295.10
351	518	31.50	0.71		3.50	1.40	175.98
352	470	3.05	0.32		4.00		130.20
353	671	4.85				1.05	74.78
354	621	19.30			0.08	0.30	39.64
355	567	14.85	0.45		0.99	4.32	245.95
356	519	0.20	1.64		1.72	27.00	118.60
357	280		1.89		4.97	19.03	31.40
358	350	0.90	2.23		24.24	18.60	143.04
359	422	0.56			9.28	2.72	112.84
360	464	3.88	0.52		2.76	1.36	113.76
361	527	27.26	0.31		0.46	0.64	29.78
362	577	28.66		0.04	0.36	0.80	30.76
363	612	31.68			2.25		196.74
364	681	5.16			6.96		57.32
MEAN		20.84	0.35	0.09	3.86	6.33	103.54

Shrimp

In the Inhaca area *H. triarthrus* and *A. foliacea* were the two main species (Table 15). Both species were distributed in 400-700 m depth range, with a tendency for *A. foliacea* to have greater occurrences in the deeper depth range than the former. The mean catch rate in the area was about 10 kg/h for each of the species. Related to the depth ranges, both had the highest mean density, 17 kg/h, at 500-600 m depth.

Highest catch rates of *H. triarthrus* were 64, 42 and 26 kg/h, and 53, 52 and 40 kg/h of *A. foliacea*.

A. antennatus, *P. balssi* and *P. edwardsianus* occurred in low catch rates, with mean 1 kg/h. The distribution pattern is the same as in the northern areas, with *P. balssi* distributed down to 500 m and the other two in deeper water.

Table 15. Inhaca. Catch rates of commercial important shrimp species, in kg/h.

ST.NO.	DEP.	H.triathr	P.edwards.	P.balssi	A.antenna.	A.foliacea	Other
317	323						219.78
318	371			8.09			133.85
319	420	2.80		7.84			202.34
320	471	64.00				40.00	130.40
321	524	14.75				25.00	29.79
322	574	25.96			0.17	30.25	91.28
323	616	4.59			0.05	5.67	88.24
324	364			1.50			62.72
325	423	0.06		3.15			81.47
326	478	17.50		0.18			46.50
327	521	5.76		0.08			47.92
328	563	0.44			0.04	52.00	65.00
329	521	12.08				11.76	83.32
330	471	6.01				1.50	27.28
331	419	3.00		0.14		0.06	56.16
332	372						51.68
333	321						72.22
334	272						541.80
335	291						149.75
336	356			0.06			93.12
337	369						56.70
338	335			0.08			79.15
339	238						105.96
340	259						12.00
341	372						48.85
342	418	4.00					116.36
343	616				0.72	20.76	134.04
344	550	6.80				2.36	104.42
345	466	6.60				0.12	207.48
346	421	21.00					178.41
347	370						68.99
348	674		2.55		0.75	3.50	127.50
349	612	7.77				0.35	73.89
350	562	41.60				52.65	309.82
351	518	24.50					188.59
352	470	0.25		0.10			137.22
353	671	0.07	2.35		0.04	0.53	77.69
354	621	3.00			6.00	6.18	44.14
355	567	9.00				3.42	254.14
356	519	0.08		0.04			149.08
357	280						57.29
358	350						190.51
359	422			0.20			125.20
360	464	1.00					121.28
361	527	24.90					33.55
362	577	24.00				4.00	32.62
363	612	3.87			0.27	27.27	199.26
364	681				3.28	1.28	66.24
MEAN		6.99	0.10	0.45	0.24	6.01	116.15

Total number of stations : 48

The abundance of deep water shrimp shows that *A. foliacea* was the most abundant, with 1134 tonnes (Table 16)

Depth (m)	200-400	400-500	500-600	600-700	Total
Area (km ²)	635	957	4990	3036	9618
<i>H. triarthrus</i>	-	101	809	80	990
<i>P. balssi</i>	22	11	-	-	33
<i>A. antennatus</i>	-	-	-	45	45
<i>A. foliacea</i>	-	31	809	294	1134
<i>P. edwardsianus</i>	-	-	-	18	45
Total	22	143	1618	437	2247

Other deep water crustaceans

Small quantities of lobster and crayfish were caught and the biomass estimated to 95 tonnes.

CHAPTER 5 SHRIMP BIOLOGY

5.1 HALIPOROIDES TRIARTHURUS

The length (L_C) frequency distributions (in 2 mm classes) per area and depth range, are presented in Figure 12.

Females had a larger size distribution than males, in general from 9 to 49 mm (L_C) and males from 15 to 37 mm. The greatest mean size for both sexes were, 36.49 mm (female) and 33.46 mm (male), occurred along the slope of Banco de Sofala (Fig. 13). The sizes decreased towards Bazaruto-B where the smallest mean L_C were observed for both sexes, 28.89 mm and 26.93 mm, respectively. The mean size tended to decrease in deeper water, mainly due to higher number of juveniles. At least 2-3 cohorts can be detected.

Highest frequency of mature females was observed at Banco de Sofala and Bazaruto-A where 27% and 14% of the females were mature. In the southern areas less than 2% were considered as mature.

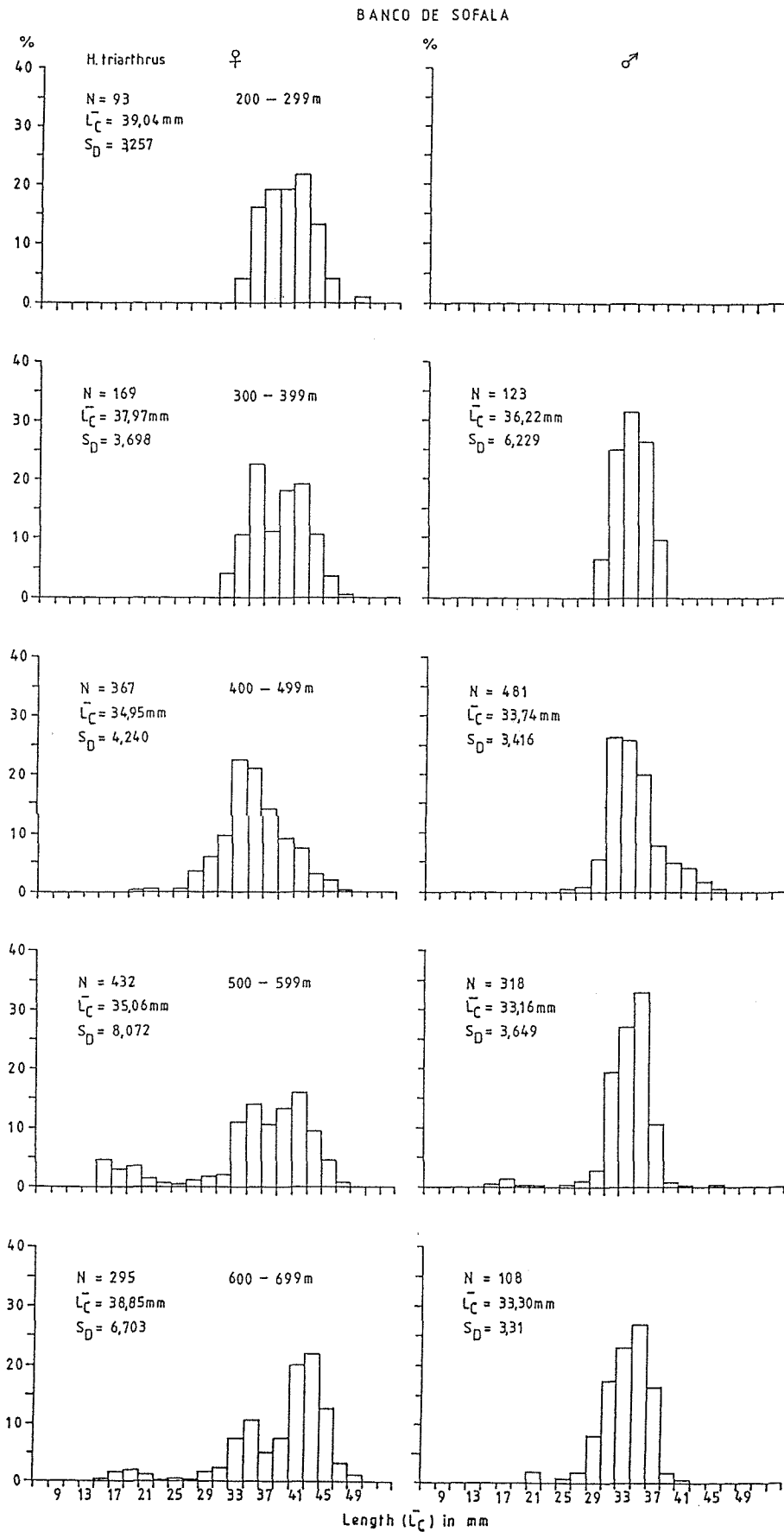


Figure 12. Length distribution (L_C) per area and depth range of *H. triarthrus*.

BAZARUTO - A

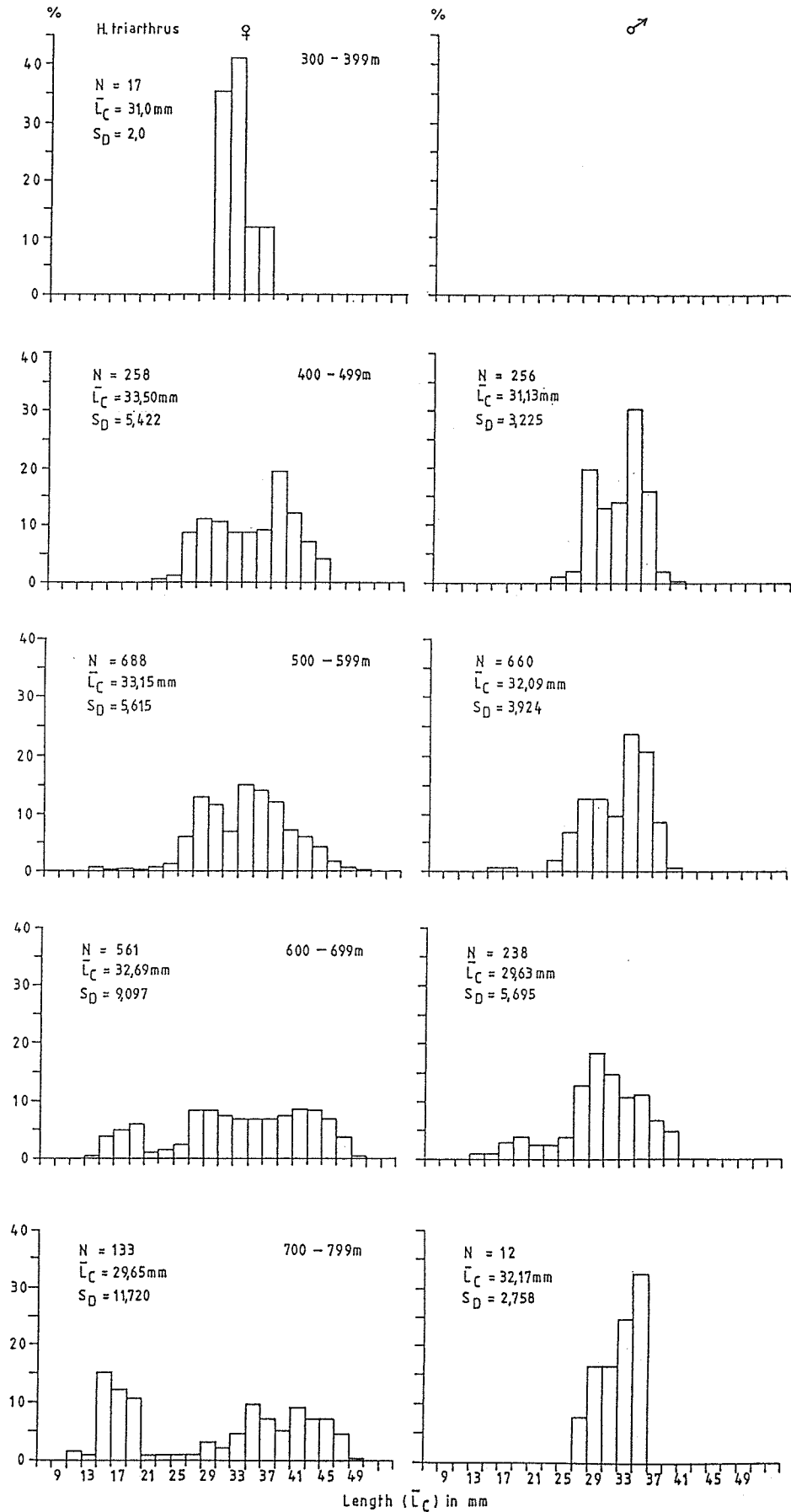


Figure 12. Cont.

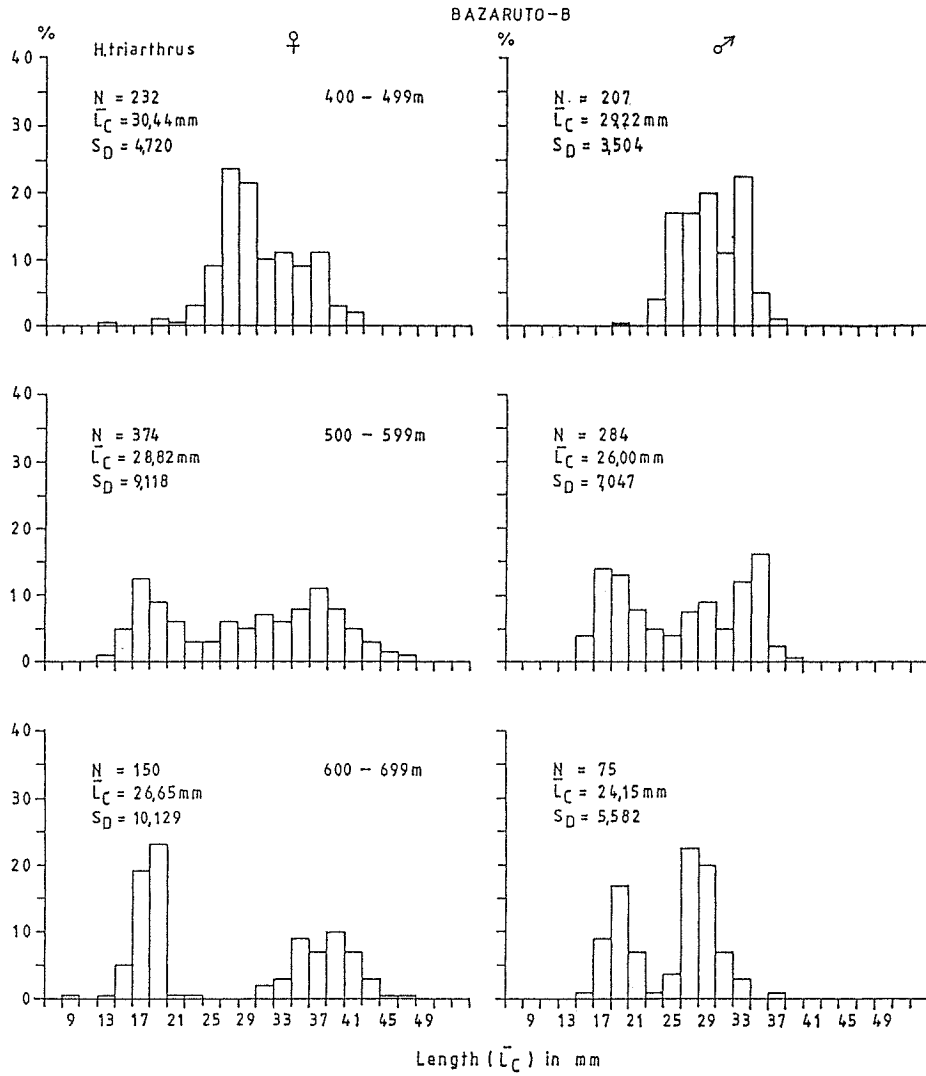


Figure 12. Cont.

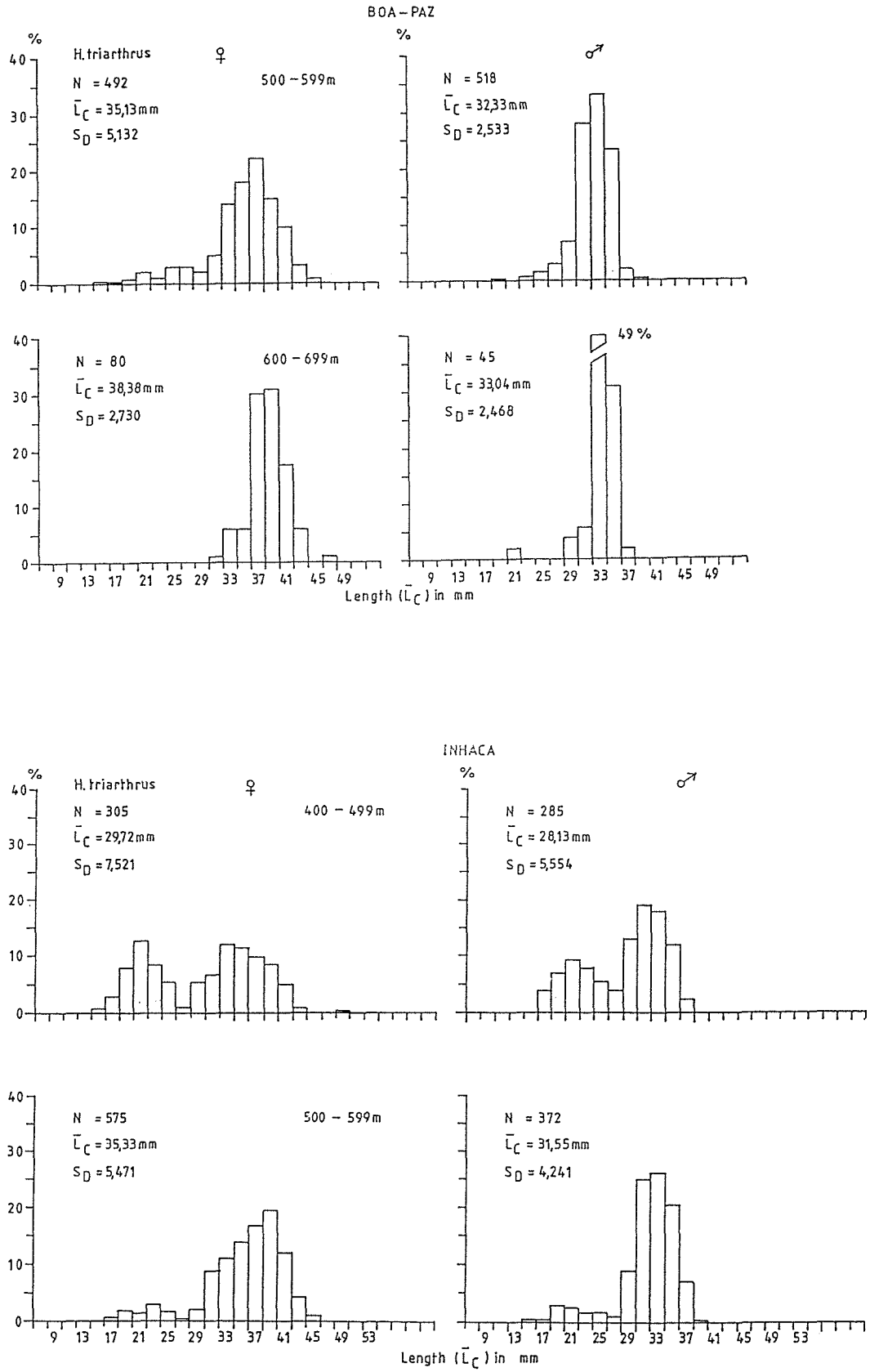


Figure 12. Cont.

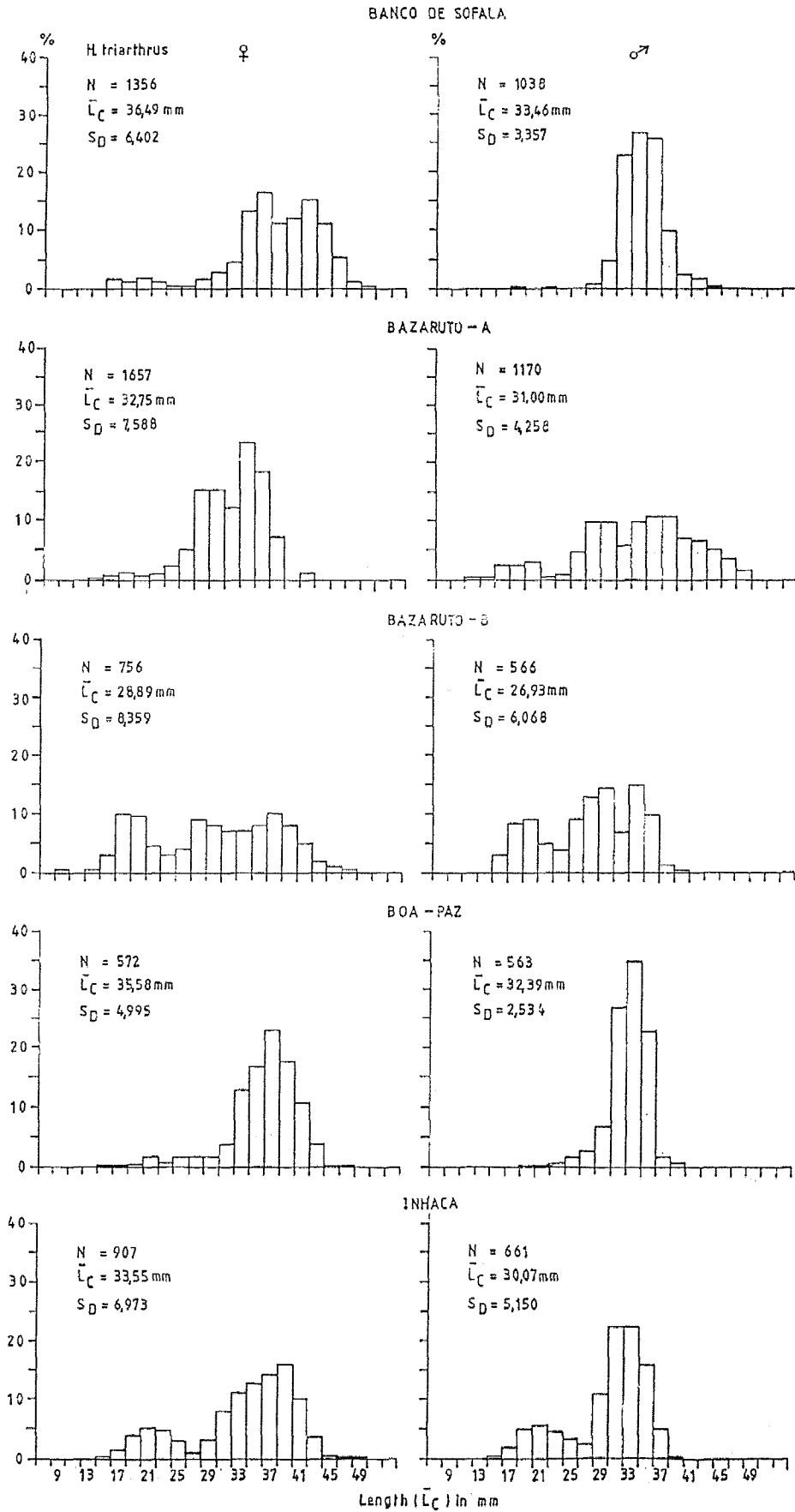


Figure 13. Length distribution (L_C) per area of *H. triarthrus*.

5.2 ARISTEOMORFA FOLIACEA

The mean size of both sexes were low along Banco de Sofala and Inhaca (Table 17). This was due to a higher amount of smaller specimens here than in the other areas. There were mainly juvenile females, probably due to a faster growth. The modal length of females at Bazaruto was 49-51 mm, with a more even distribution among the length groups along Banco de Sofala. Modal peaks of males were 39-41 mm.

Area	Female			Male		
	L_C	N	SD	L_C	N	SD
B. de Sofala	39.64	270	10.634	37.05	276	6.214
Bazaruto-A	49.19	129	4.740	39.04	108	1.640
Bazaruto-B	45.34	64	8.798	38.27	22	2.097
Boa Paz	49.77	39	5.441	39.15	39	3.653
Inhaca	36.93	821	12.036	37.00	349	4.368

CHAPTER 6 BY-CATCH

By-catch, represented by squid, sharks and fish, made in general 80-90% of the total catch in each subarea.

The data of by-catch will be taken care of and analysed by IIP, but a brief summary of the biomass of squid and shark (in tonnes), is given in the following table:

	B.de Sofala	Baz-A	Baz-B	Boa Paz	Inhaca
Squid	660	1088	441	730	406
Shark	2250	588	588	412	574

CAPTER 7 CONCLUDING REMARKS

Earlier surveys for resources of deep water shrimp in Mozambique, have mainly covered the areas south of 21°00'S, which are the traditional fishing areas. During the last years, there have also been a fishery for deep water shrimp along the slope of Banco de Sofala, and thus it was of great importance to gain knowlegde of the stocks in that area. From the results it is thought that the present investigation has provided comprehensive data for the distribution area, and specially the northern area.

Catch information given by the fleets are separating the catches of deep water shrimp into two commercial groups, "pink" and "red". Relating our data to this grouping, *Haliporoides triarthrus*, *Aristeus antennatus* and *Penaeopsis balssi* are "pink" and *Aristeomorpha foliacea* and *Plesiopenaeus edwardsianus* are "red".

The total biomass of commercial resources of deep water shrimp in the whole surveyed area, 16°30' S and 21°50' S, is estimated to 5450 tonnes (Table 18). Of this, 27% are distributed north of 21°00'S. At Bazaruto A the estimated biomass was low. This might be due to low seasonal availability at this time of the year, which is also reflected in commercial catch data.

H. triarthrus was the most important species in all areas except Inhaca, where *A. foliacea* made more than 50% of the biomass. Overall, these two species covered 76% of the total biomass.

Earlier assessments are based on catch data of *H. triarthrus* and *A. foliacea*, and for comparison, the biomass of these two stocks combined is included in Table 18. The total biomass of these two was 4160 tonnes, with about 3 200 south of 21° S.

Table 18. Total biomass of deep water shrimp per area, in tonnes.					
	B.de Sofala	Baz.-A	Baz.-B	Boa Paz	Inhaca
Pink	1294	352	543	604	1068
Red	204	25	171	11	1179
Total	1498	377	714	615	2247
<u>A. foliacea</u> + <u>H. triarthrus</u>	1017	237	366	415	2124

The German trawler was rigged as a beam trawler, fishing with two trawls each having a horizontal opening of 18 m.

The results from the comparative fishing programme which, gave a higher catchability of shrimp in the trawl used by R/V "DR. FRIDTJOF NANSEN" than in those of the commercial shrimp trawler. The catch rate per trawl was in average 1.5 times the German catch rates.

The preliminary biomass estimates of *H triarthus* made by the two vessels south of 21°S, gave 1 965 (R/V "DR. FRIDTJOF NANSEN") and 1 932 tonnes (German). Keeping in mind that the German estimate is based on catch /hour from two trawls and the R/V "DR.FRITJOF NANSEN" estimate includes data from a larger area (further south) the estimates are considered of to be in the same order.

Before any management advice is given, the total biomass estimate together with a comparison of the lenght distribution from both vessels should be considered as well as the development in the commercial data.