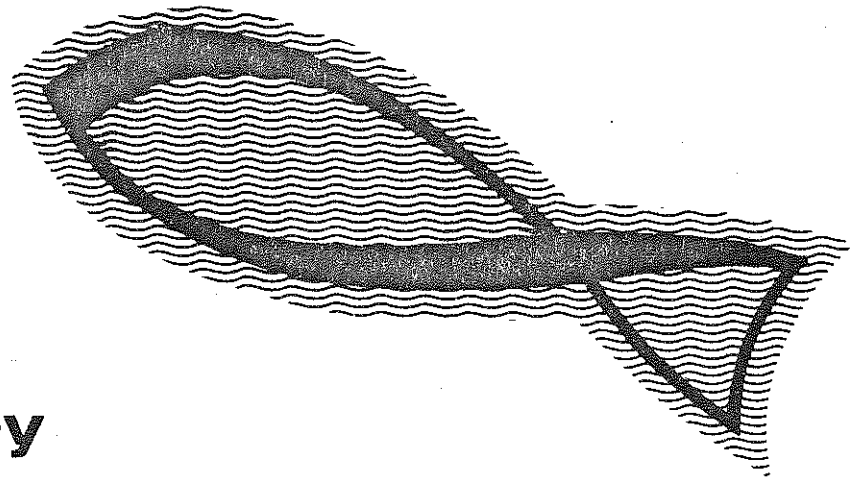




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**Preliminary Investigation
of the Population of Juvenile
Salmonids in the Corrib
System**



by

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Population assessments of the juvenile salmonids in the Corrib system are being made as part of the overall management plan for the Galway Fishery. This leaflet is the first of a series of reports which will be issued annually to give up-to-date information on the stocks and on the state of the tributaries used for spawning and nursery grounds. Eight tributaries were surveyed in 1979 and in two cases an upstream and a downstream reach were examined.

The main rivers of the Corrib System are shown in Fig. 1. The catchment has an area of 3,300 square km. The system can be divided into two water types, low alkalinity in the western part and high alkalinity waters to the east.

In preparing a fish population inventory the fish are caught, marked and returned to the river in one day. On the second day the population in the same place, now composed of marked and unmarked fish, is sampled and the total population estimated using the Petersen Formula.

MATERIALS AND METHODS

Physical features

Length, average width and depth of each reach were measured. The percentages of gravel, stone, silt and mud present in each were estimated by eye; together with the extent of the river types, riffle, deep flow or pool. The bank cover was recorded on an arbitrary absence or presence scale from 0 to 4.

Fauna

All fish species present in each reach were counted and described as:

Plentiful - more than 50
Frequent - 10 - 49
Rare - 1 - 9

A standard macro-invertebrate sample was taken at every reach. This involved holding a pond net at arms length downstream while disturbing the river bed upstream with the feet.

Collection for mark-and-recapture

Two teams worked on each stretch : one in the river, electrofishing; the other on the bank recording, measuring and tagging. Each reach was fished in stretches of approximately 40 metres, being the length of the electro-fishing cable. Four buckets were placed on the bank at intervals dividing the stretch into quarters. The fish were placed in the nearest bucket on capture, buckets being replaced by the bank team when filled or when the fishing team had passed on to the next one.

On the bank each fish was transferred by hand, to a container of the anesthetic MS222. Fork length was measured to the nearest mm and a part of the dorsal fin was removed. After this treatment the fish was returned to the original bucket to recover. All fish were returned to the water as soon as they had become active. In this way fish were handled as little as possible and were returned to the water quickly and close to their home territories. After release the fish rarely moved upstream and so were seldom recaptured immediately.

The day following the initial fishing and marking the procedure was repeated in each reach. The length of each fish captured was measured, and the numbers of marked and unmarked fish recorded but no further fin clipping took place.

Population assessment

The estimate of the numbers of salmonids present was made using the Petersen formula as discussed by Ricker :

$$N = \frac{C (M + I)}{R + I}$$

Where N = the estimate of the numbers present

M = the number marked on the first day

R = the number of market fish caught on the second day

C = the total number caught on the second day

The results are expressed in numbers per square metre in Tables 5 and 6. The "Best" number per square metre is the estimated population and the maximum and minimum numbers per square metre are the estimated population plus and minus the 95% confidence intervals. Each age group was estimated separately. Where it was difficult to separate the age groups, scales were taken from fish in the overlap length groups. These scales were later read to determine the age groups.

The value for "survival" is the ratio of the best estimate of population of an age group to that of the next lower group.

RESULTS

Detailed values for all the tributaries are given in the following Tables :

1. Water conductivity, alkalinity and pH.
2. Physical features of reaches sampled.
3. Invertebrate collections.
4. Mean lengths of salmon and trout according to age groups.
5. Salmon population estimates.
6. Trout population estimates.

The characteristics of each tributary and its fish population are outlined in the following section.

The Sinking River

The Sinking River rises in poor quality land north-east of Dunmore. The land quality improves as the river nears Dunmore and from there to its confluence with the Clare River at Bussetstown the surrounding land is fertile. Alkalinity and pH of the river are relatively high. Population estimates were carried out on two reaches : at Boyonagh Bridge and 4 km downstream of this point below Dunmore.

The Boyonagh Bridge reach was fished on August 20 and 21. The water level was higher on the first day. The fishing conditions were difficult due to high water levels and this may explain the lack of 0+ fish.

The reach measured just under 4 metres in width and made a relatively good salmonid habitat with bed of stone and gravel with 60% deep flow and 35% riffle. Trout were plentiful, eel and stone loach frequent but salmon were rare. A shortage of clean-water invertebrates suggested that there was mild pollution, possibly from intensive farming enterprises upstream.

Trout in the 0+ group were recorded only on the second day. The 1+ trout numbers at 0.076 were amongst the highest found in the tributaries. The 2+ numbers at 0.035 represented the only population of trout of this age in all the tributaries sampled. Only two salmon were recorded, both were 1+. Mean lengths of the trout were amongst the highest recorded. The survival of trout from 1+ to 2+ was 0.46.

The Dunmore Castle stretch was fished on August 24th and 27th. The reach measured under 7m in width and made a very good salmonid habitat with bed of gravel and stone with 50% riffle, 45% deep flow and 5% pool. Salmon, trout and stone loach were plentiful while eels were frequent. A large number of clean water invertebrates indicated that the water was of a good quality and had recovered from the upstream pollution.

Numbers of both 0+ and 1+ salmon at 1.4 and 0.4 respectively were the highest recorded from tributaries in the eastern part of the system. The mean lengths of the salmon in this reach were among the highest for any of the tributaries. The survival from 0+ to 1+ salmon was 27%

The numbers of 0+ trout at 0.2 were among the lowest recorded. There were not sufficient 1+ fish caught to estimate the population by the Petersen method, however an efficiency factor of 0.61 was used to estimate the population.

The Grange River

This river rises in the same area as the Sinking. The land quality improves after the first five miles and as it nears its confluence with the Clare River the surrounding land is fertile. Alkalinity and pH of the water are relatively high. Population estimates were carried out on two reaches : at Cloondahamper and downstream of this point at Castlemoyle. The Cloondahamper reach was fished on August 10th and 13th. Conditions for electrofishing were good on both occasions. The reach measured just over 3m in width and made a very good juvenile salmonid stretch with bed of stone and gravel with 70% riffle and 30% deep flow. Trout and salmon were plentiful, stone loach frequent and pike rare. Though the numbers of invertebrates recorded were low, clean water species were dominant indicating water of good quality.

Numbers of 0+ salmon were among the highest recorded for tributaries in this part of the system. The high percentage of riffle and width of the stream is the explanation for the scarcity of 1+ salmon which seem to move out of this section at the 0+ stage. The mean lengths of 0+ salmon were about average. The numbers of trout in this stretch were relatively high. This was one of the few reaches where sufficient 1+ fish were caught to estimate the population. The mean lengths of 1+ trout were the highest recorded. The survival of trout from 0+ to 1+ was 15.7%.

The Castlemoyle reach was fished on August 8th and 9th. The water level was higher on the second day. The fishing conditions were more difficult due to high water levels which lead to fewer fish being caught on the second day. This reach measured just under 6m in width and made a satisfactory salmonid habitat with bed of stone, gravel and silt with 70% deep flow and 30% riffle. Trout, salmon and stone loach were plentiful, eel frequent and pike rare. The large number of clean water invertebrates indicated the water was of good quality.

The numbers of salmon in this stretch were among the lowest recorded for any of the tributaries. The mean length of the 1+ group was the highest recorded for any tributary. The survival from 0+ to 1+ was 22%. The number of trout in this reach was also very low.

The Abbert River

This river rises south east of Monivea. The land quality improves after the first six miles and from here to its confluence with the Clare River at Anabally the surrounding land is mostly of good quality. The Abbeyknockmoy reach was fished on the 31st July and 1st August. Conditions were suitable on both occasions. The reach measured 7.5m in width and made a satisfactory salmonid habitat with bed of stone, gravel and silt with 70% riffle, 25% deep flow and 5% pool. Trout, salmon and stone loach were plentiful, eel frequent and three spined stickleback rare. The large numbers of clean water invertebrate^s indicated water of good quality.

The numbers of salmon were about the common average for the rivers in this part of the system. The mean lengths were also about average and the survival from 0+ to 1+ was 21%. No 1+ trout were caught. It seems that fish move out of this river between 0+ and 1+ and go into the Clare river.

The Dunmore (Roymonahan) River

This river rises north of Dunmore and enters the Sinking downstream of Dunmore. The upper section flows through poor land while the lower part flows through good agricultural land. The stretch electrofished was approximately 200m upstream of the confluence with the Sinking River. The Dunmore Stretch was fished on August 24th and 27th. Conditions were good on both occasions. The reach measured approximately 4m in width and made a fair salmon habitat with bed of gravel, stone and silt with 50% riffle, 45% deep flow and 5% pool.

The high number of clean water invertebrates indicated water of good quality. Salmon, trout and stone loach were plentiful while eel and pike were frequent or rare.

The numbers of salmon in this reach were the lowest for rivers in this part of the catchment. The mean length of the 0+ salmon was the highest for any tributary in the system. The survival from 0+ to 1+ was very high at 57%. The trout numbers were high. It was the only reach where sufficient 2+ trout were caught to estimate the population. The mean lengths of trout were about average for the system. The survival for 0+ to 1+ was 8% and from 1+ to 2+ was 20%.

The Deereen River

This river is a tributary of the Abbert, rises in Horseleap Lake and enters the Abbert upstream of Abbeyknockmoy. The reach electrofished was approximately 100m upstream of the confluence with the Abbert River. This reach was fished on July 27th and 30th. Conditions for electrofishing were good on both occasions. The reach measured 3m in width and made a satisfactory salmonid habitat with bed of gravel, stone and silt, with 70% riffle and 30% deep flow. Salmon and trout were plentiful and stone loach rare. The number of clean water organisms indicated water of high quality.

The numbers of salmon in this reach were low. There were not sufficient numbers of 0+ salmon to estimate the population by the Petersen Method. The mean lengths of trout in this reach were the lowest recorded for any river in this part of the system.

The Owenriff River

This river rises in the Shanamon Mountain area, and has four lakes along its course to Lough Corrib which it enters downstream of Oughterard. It flows through boggy land for its entire course. The pH and alkalinity are low. A population estimate was carried out on a reach at Derryerglinna. The Derryerglinna stretch was fished on August 28th and 29th. Fishing conditions were good on both occasions.

The reach measured just over 8m in width and made an excellent salmonid habitat with bed of gravel and stone with 60% deep flow and 40% riffle. Salmon were plentiful, trout frequent and minnow rare. The number of clean water invertebrates found indicated water of good quality.

Only 15 0+ trout were caught on the first day and out of a total of 12 caught on the second day only 2 were marked. These numbers are extremely low considering an area of 1757 sq m was fished. No 1+ trout were caught.

The numbers of salmon in this reach were high. There was overlap of the 1+ and 2+ age groups but it was assumed from scale reading that the majority of the salmon under 11.0 cm belonged to the 1+ group and those over 11 cm belonged to the 2+ group. This was the only river in which a substantial number of 2+ salmon were found. The lengths of salmon were the second lowest recorded. The survival of salmon from 0+ to 1+ was 11%.

The Bunowen River

The Bunowen River is a tributary of the Owenriff. It rises near Knockletterfore Mountain and enters the Owenriff River at Rusheeney. It is a spate river flowing through boggy land for its entire course. Alkalinity and pH are low. A population estimate was carried out on a reach upstream of Glengowla Bridge. The Glengowla Bridge reach was fished on August 22nd and 23rd. Fishing conditions were difficult on the second day due to high water levels and this may explain why fewer fish were caught on the second day. The Glengowla Bridge reach measured just over 3m in width and made a good salmonid stretch with bed of stone and gravel, with 60% deep flow 35% riffle and 5% pool. Salmon and trout were plentiful, minnow frequent and eel rare. The large numbers of clean water organisms indicate water of a high quality. The numbers of 0+ salmon in this reach were high.

Only nine 1+ salmon were caught, all on the first day. The reason for this may be that the majority of the salmon in this river move into the Owenriff River between 0+ and 1+. The mean length of 0+ salmon at 4.1 cm was the lowest recorded for any river in the system. The numbers of trout in this reach were low. The small size of the 0+ trout also contributed to the low number of recaptures. The mean lengths of trout in this tributary were among the lowest recorded.

The Loughkip River

This river rises south west of Moycullen in Loughkip and enters Lough Corrib east of Moycullen. This river flows through poor agricultural land for its entire course. The alkalinity and pH were low. The Loughill reach was fished on September 3rd and 4th. Conditions was ideal on both occasions. This stretch measured over 4m in width and made a satisfactory salmonid habitat with bed of stone, gravel and silt with 55% deep flow, 40% riffle and 5% pool. Trout were plentiful but salmon and eel were rare.

Only four salmon were caught in this reach and all were 1+. The number of trout in this river was the highest for any river in the system. The mean length of the 0+ trout was the highest for rivers in this part of the system. The survival from 0+ to 1+ was 28% and from 1+ to 2+ was 10%.

The Cornamona River

This river rises at Lugnabrick Mountain and enters Lough Corrib east of Cornamona. It flows through poor quality land for its entire course, and has been recently drained. The pH is average but the alkalinity and conductivity are very low. The Crumlin stretch was fished on August 15th and 17th. Fishing conditions were good on both occasions. This reach measured just under 7m in width and made an excellent salmonid habitat with bed of stone and gravel with 70% riffle, 25% deep flow and 5% pool. Salmon and trout were plentiful but eels were rare. The number of clean water invertebrates found indicated water of a good quality.

The numbers of salmon were exceptionally high. The lengths of the salmon were among the lowest recorded. The survival from 0+ to 1+ was 10%. The lengths of 0+ trout at 5.11 cm was the lowest recorded for any river in the system.

DISCUSSION

The Sinking River

This river is a relatively productive river, but its potential is reduced by mild agricultural pollution in the upper reaches. It has a water quality biological index figure of 4 and is of satisfactory quality according to the Foras Forbartha report, June 1978. The length and survival of salmon and trout are among the highest recorded which make it suitable as a salmonid nursery area.

The Grange River

The area surveyed at Cloondahamper appears to be the only area with significant numbers of salmon. Even here pike are present. Three other sites were surveyed in the lower section of this river and they revealed low numbers of both salmon and trout. This river was drained prior to 1960 and many areas of it are void of gravel suitable for spawning fish.

The Abbart River

This river is considered of satisfactory quality by the Foras Forbartha report, June 1978. There were no 1+ trout caught in the reach fished. A second reach downstream fished once revealed similar results. The 1+ trout seem to move out into the Clare river. This river was recently drained and parts of it are now covered in a layer of silt and are overgrown with macrophytes.

The Dunmore River

This river has been recently drained and there is quite a lot of silt in the pool areas. The fast growth rate and high survival may be explained by the abundance of food, which is obvious from the invertebrate sample. This river seems to be the trout nursery for the Sinking.

The Deereen River

This river is well stocked with 0+ trout. Apparently salmon do go into it in some years to spawn, since some 1+ salmon were caught. The poor growth rate may be explained by the poor quality of the surrounding terrain.

The Owenriff River

This river is considered of satisfactory quality by the Foras Forbartha report, June 1978. Very few trout were caught. This may be explained by an impassible waterfall upstream of Oughterard. The confidence intervals of the population are wide because of the size of the fish and low conductivity of the water. The slow growth rate and low survival may be due to the poor quality of the surrounding terrain and the scarcity of food.

The Bunowen River

This river is a productive 0+ salmon river. The length of the 0+ salmon is the lowest recorded and this may be explained by the poor quality of the surrounding terrain and low pH of the water. The 1+ salmon seem to move into the Owenriff River. The number of trout is low. This river seems to be at its maximum productivity from the growth rates and survival.

The Loughkip River

This is the most productive trout water of all the rivers surveyed in the system. Though the growth rate is slow the survival is about average. There are no 0+ salmon in the upper reaches but four 1+ salmon were caught indicating that salmon do go into the upper reaches some years.

The Cornamona River

This is a highly productive river of high water quality. The bed is ideal for salmonid spawning, but food is the limiting factor which explains the slow growth rate and low survival.

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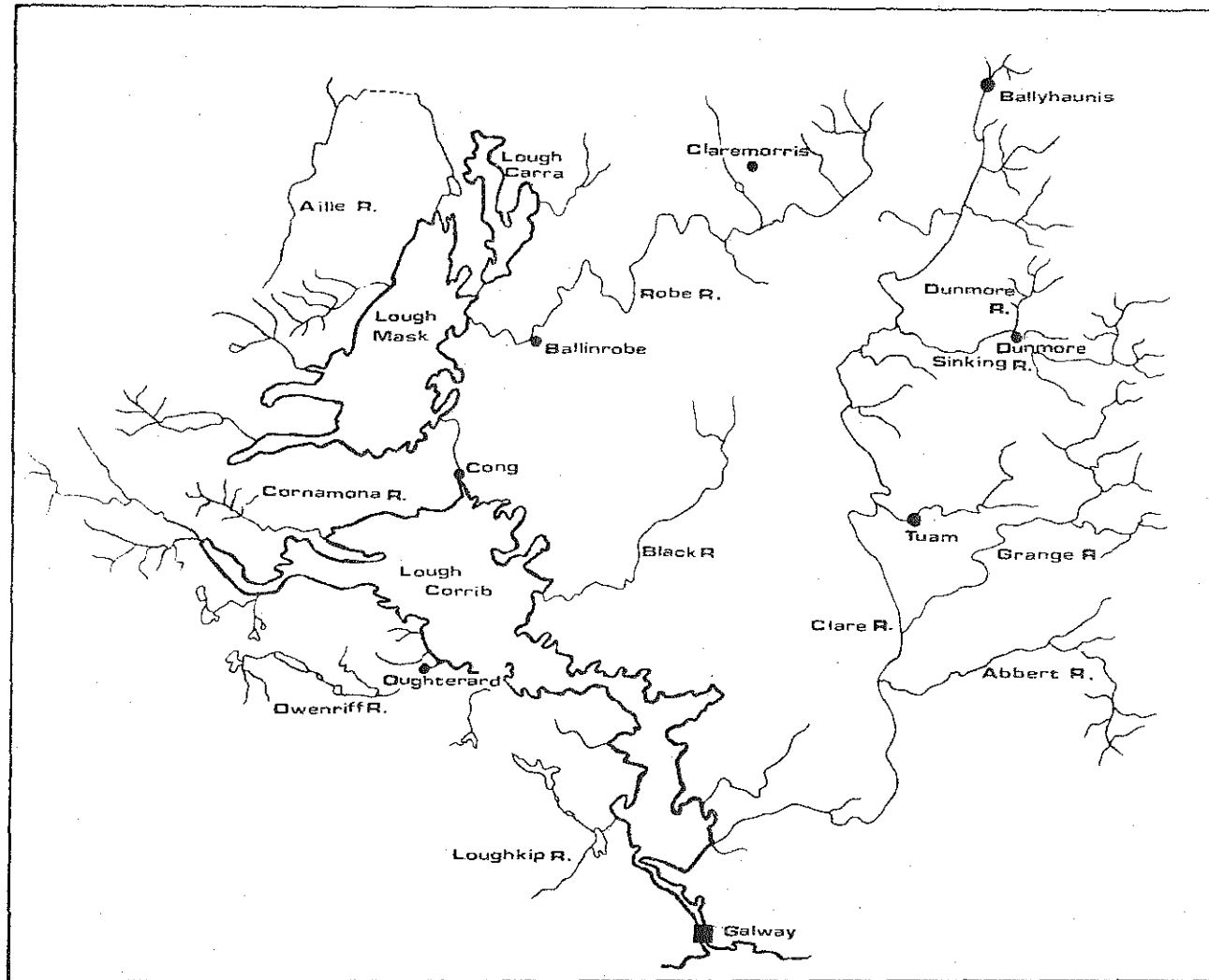


Fig. 1 Map of the Corrib System showing the tributaries investigated.

River	Date	Map ref.	pH	Total Alkalinity mg/l	Conductivity Micro Siemens
Grange	11.8.79	M,445,449	7.8	260	560 x 10 ⁻⁶
Sinking	10.9.79	M,500,639	7.8	192	430 x 10 ⁻⁶
Loughkip	4.7.79	M,157,798	7.0	43	160 x 10 ⁻⁶
Owenriff	15.8.79	M,107,476	6.5	15	58 x 10 ⁻⁶
Bunowen	22.8.79	M,084,464	6.9	18	68 x 10 ⁻⁶
Cornamona	17.9.79	M,040,575	7.2	6	51 x 10 ⁻⁶

Table 1. Chemical parameters of tributaries sampled in the Corrib System.

	Mayfly	Gammarus	Stonefly	Cased Caddis	Caseless Caddis	Red Chironomid	Green Chironomid	Limnea	Planorbis	Leech	Simulium	Beetles	Bivalve Molluscs	Lumbricus
Sinking upper	5	N		N	15	3	1	1	10	2	16	2		
Sinking lower	36	64		20	5	1	2	14	10	N	N	6		
Grange upper	14	12		6	4	N	N	6	N	N	N	14		
Grange lower	18	46		10	4	3	4	14	N	2	2	6		
Dunmore	36	1		40	10	15	2	10	4	N	N	6		
Abbert	14	67		31	2	N	4	14	8	2	N	10		
Deereen	6	1		10	4	N	1	16	2	N	N	7		
Owenriff	6	N	14	1	3	1	1	15	2	N	N	1		1
Bunowen	14	16	19	20	1	N	1	1	12	N	N	16		1
Loughkip	16	12	12	2		N	6	N	N	N	N	1	14	1
Cornamona	6	N	3	N	14	1		N	N	N	N	2		

Table 2 : Macro - invertebrates found in the tributaries of the Corrib sampled

River	(0+) Salmon		(1+) Salmon		(0+) Trout		(1+) Trout		(2+) Trout	
	Mean length	S.D.	Mean length	S.D.	Mean length	S.D.	Mean length	S.D.	Mean length	S.D.
Sinking Upper							15.91	1.33	26.19	3.15
Sinking Lower	7.76	0.63	12.77	1.35	8.28	0.81				
Grange Upper	6.74	0.61	-	-	8.10	0.75	17.94	1.87	-	-
Grange Lower	6.60	0.64	13.70	0.91	7.71	0.63	-	-	-	-
Dunmore	7.45	0.63	12.70	0.97	7.34	0.77	15.01	1.94	-	-
Abbert	6.25	0.59	12.55	1.06	8.34	0.80	-	-	-	-
Deerden	5.41	0.43	11.41	0.92	6.59	0.64	14.67	2.87	-	-
Owenriff	4.30	0.52	8.60	1.04	-	-	-	-	-	-
Bunowen	4.10	0.44	-	-	5.75	0.69	11.39	1.15	-	-
Loughkip	-	-	-	-	5.89	0.60	11.78	2.06	18.53	1.34
Cornmaona	4.45	0.45	8.08	1.07	5.11	0.57	-	-	-	-

Table 3 : Mean lengths of salmon and trout in the Corrib tributaries

Tributary	Fork length	Age	First fishing	Second fishing		Best estimate	Numbers per m ² and 95% limits			Survival
	(mm)		M	R	C	N	Min	Mean	Max	
Sinking upper										
Sinking lower	5.0 - 8.9	0+	278	52	250	1316.4	1.09	1.44	1.80	27%
	10.0 - 15.9	1+	134	42	112	351.6	0.30	0.38	0.48	
Grange upper	5.0 - 9.9	0+	129	40	132	418.5	0.86	1.16	1.45	
	11.0 - 13.9	1+	5	1	4					
Grange lower	5.0 - 8.9	0+	72	13	48	250.3	0.14	0.26	0.38	22%
	10.0 - 15.9	1+	48	26	42	76.2	0.06	0.08	0.10	
Abbert	6.0 - 8.9	0+	94	12	80	584.6	0.36	0.70	1.05	21%
	10.0 - 16.9	1+	36	9	34	125.8	0.07	0.15	.23	
Dunmore	6.0 - 8.9	0+	37	13	27	73.3	0.07	0.11	0.16	57%
	10.0 - 14.9	1+	24	17	30	41.7	0.05	0.06	0.08	
Deereen	4.0 - 6.9	0+	19	3	32					
	9.0 - 14.9	1+	38	14	31	80.6	0.09	0.15	0.21	
Bunowen	3.0 - 5.9	0+	168	15	157	1658.3	1.13	2.08	3.04	
	8.0 - 12.9	1+	9	0	0					
Loughkip	10.0 - 11.9	1+	2	0	0					
Owenriff	2.0 - 5.9	0+	268	21	245	2995.7	1.02	1.71	2.39	11%
	6.0 - 10.9	1+	55	9	60	336.0	0.09	0.19	0.29	
	11.0 - 14.9	2+	10	0	9					
Cornamona	3.0 - 6.9	0+	400	27	451	6458.9	3.31	4.73	6.43	10%
	7.0 - 11.9	1+	120	21	125	687.7	0.31	0.50	0.69	

Table 4. Length, numbers and survival of salmon.

Tributary	Fork length	Age	First fishing	Second fishing		Best estimate	numbers per m ² and 95% limits			Survival
	(mm)		M	R	C	N	Min	Mean	Max	
Sinking upper	14.0 - 19.9	1+	37	70	33	59.7	0.05	0.57	0.09	47%
	20.0 - 31.9	2+	16	10	18	27.8	0.02	0.03	0.04	
Sinking lower	6.0 - 10.9	0+	53	8	25	150.0	0.07	0.16	0.26	
	14.0 - 21.9	1+	3	1	7					
Grange upper	5.0 - 9.9	0+	82	23	63	217.8	0.40	0.60	0.80	16%
	16.0 - 21.9	1+	24	16	24	35.3	0.07	0.10	0.12	
Grange lower	6.0 - 9.9	0+	70	9	41	291.1	0.13	0.30	0.47	
	14.0 - 21.9	1+	3	0	2					
Abbert	6.0 - 10.9	0+	79	13	75	428.6	0.27	0.51	0.75	
Dunmore	5.0 - 9.9	0+	247	88	238	663.2	0.85	1.02	1.19	7% 40%
	10.0 - 18.9	1+	31	72	33	45.9	0.05	0.07	0.09	
	19.0 - 27.9	2+	8	8	9	9.0		0.01		
Deereen	4.0 - 8.9	0+	244	36	258	170.8	2.71	3.16	4.10	
	10.0 - 19.9	1+	21	4	13					
Bunowen	3.0 - 6.9	0+	73	8	48	394.7	0.21	0.49	0.78	
	9.0 - 14.0	1+	28	2	14					
Loughkip	4.0 - 7.9	0+	397	76	301	1555.8	1.06	1.33	1.60	27% 10%
	8.0 - 16.9	1+	184	76	177	425.9	0.30	0.36	0.43	
	17.0 - 22.9	2+	17	7	19	42.7	0.02	0.04	0.06	
Owenriff	3.0 - 5.9	0+	15	2	12					
Cornamona	3.0 - 6.9	0+	168	21	151	115.99	0.52	0.85	1.18	
	7.0 - 12.9	1+	13	1	17					

Table 5. Length, numbers and survival of trout