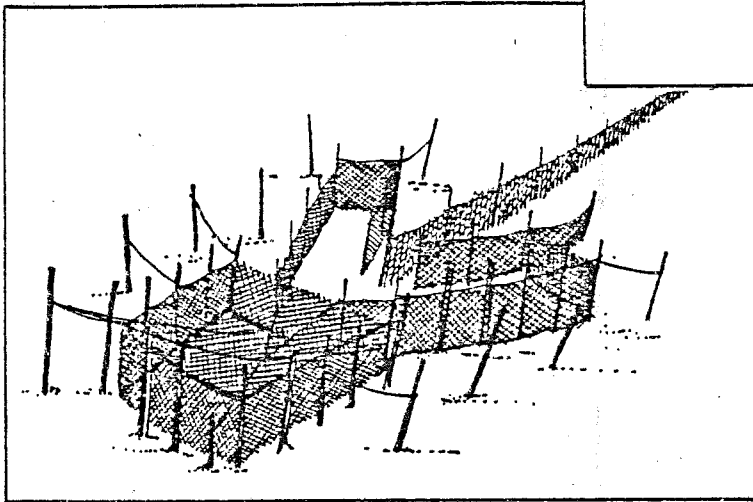
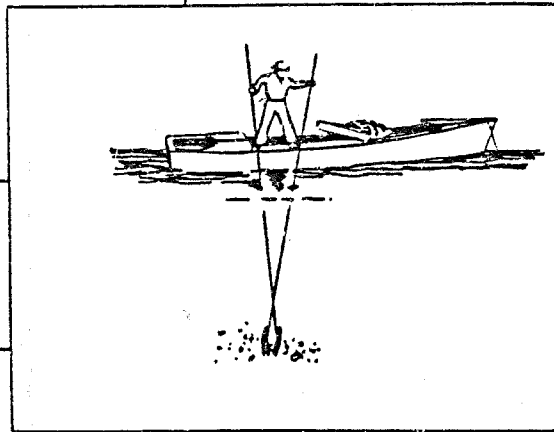
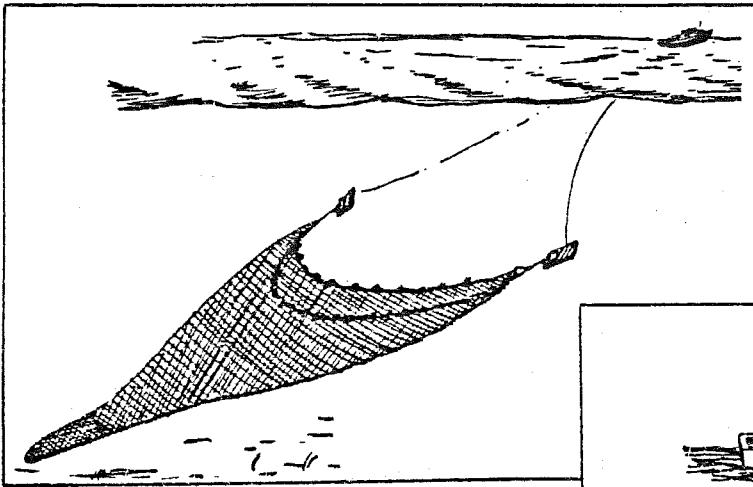


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FISHING GEAR STATISTICS OF VIRGINIA 1929-1977

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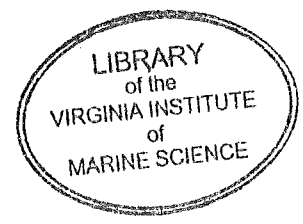
by W.J. Hoagman
J.C. Siefert



1980

Special Report No. 12
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Gloucester Point, Virginia 23062

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W. J. Hoagman and J. C. Siefert

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GENERAL ASPECTS OF FISHERY and GEAR

The commercial fishery of Virginia uses over 30 gear types to capture the species in this report. We have selected 19 gears for illustration and description, and 10 species for detailed analysis. The species selected for analysis were chosen from the list of 18 presented in Hoagman and Rathbone (1980)¹, which provided landings and value information Statewide and for the James, York, and Rappahannock Rivers 1955-77. The gear statistics provided here cover 1929-77, but the rivers are not treated separately. The river data has been incorporated into the statistics reported as a Virginia Totals and Averages.

The National Marine Fisheries Service (NMFS) provided the basic information of catch, value, and gear breakdowns by species in their U.S. Fishery Digest annual reports. The statistics for gear number are tabulations of licenses granted the fishermen,² but the catch by gear are estimates by NMFS based on the sampling program that gathers all landings information through ground survey and telephone contacts. The program is considered accurate within 5% of the actual catch.

No adjustment has been made to the dollar values to convert them to "standard" or "uninflated" dollars over the 1929-77 period. The tables report the value received by the fishermen upon sale to the fish dealer.

Some of the gear considered here remains unchanged from the thirties, while some others have undergone minor modifications that have no-doubt improved efficiency. The fishery in general has modernized and mechanized over the years, allowing most gears to be used (set, retrieved, tended, unloaded, etc) more efficiently, but we have no record of these developments that are detailed enough to allow adjustment of yearly catch to correct for increased efficiency. Any known changes are discussed with that gear.

1. Hoagman, W.J. and D.R. Rathbone, 1980. The Commercial Fishery of Virginia 1955-77, with emphasis on the James, York, and Rappahannock Rivers. Special Report No. 11. Remington House Publishing Company, Gloucester Point, VA 192 pp.
2. In Virginia no distinction is made between a license sold for commercial use or home use.

Catch-per-unit-of-effort (c/f) is a common statistic used to account for difference in gear number and usage between years. It is better measurement of population size than landings. Landings will usually reflect the major trends and species composition of the catch, but if changes in fishing efforts occur the yearly comparisons become tenuous. The c/f statistic averages out the gear in use to unity over time.

For precise analysis of population fluctuations with c/f, several components should be known, they are; the amount of gear used, any changes in gear efficiency, any changes in fishing areas, any changes in fish behavior, any changes in mesh restrictions or size limits, and any changes in the size of the fishing area. For most situations, data will be available for only the amount of gear used, the landings, and perhaps size or mesh limits. In Virginia the amount of gear used is unknown, but the number of gear units licensed to the fishery is known. Yearly c/f is defined as catch per licensed gear per year, and while not wholly satisfactory, gives a relative measure of stock that is more precise than landings. If every gear licensed was used to the same general extent each year it was licensed, any difference between c/f based on usage and c/f based on number of units would tend toward zero.

This report therefore defines a unit of effort as one licensed gear. It is assumed the gear was used that year, like others of the same type, and to the same extent. The amount of use by all units of one type, thus becomes an average based on the total number licensed. All licensed gear, divided into total catch assigned to that gear type, gives average yearly catch per gear, or our c/f. It is assumed that any changes in gear efficiency have been minor over the period. Mesh sizes have never been restricted in Virginia and size limits effectively non-existent.* The same zones are fished now as 30-40 years ago and the organisms have not changed habits to any detectable extent.

* Except for crabs and oysters, size limits are ignored because of the dead or dying clause.

Within the Gear Statistics section, the catch of any particular gear represents the catch of all species the gear is designed to capture. The miscellaneous shell fish catch (crab, oyster, clams) has been subtracted for finfish gear, and the miscellaneous finfish catch has been subtracted from shellfish gear (such as crab pots, oyster dredges, etc). Within the Species Landings section, c/f means the catch of that species divided by the gear units by type licensed that year. The gear c/f's give average fishing success for all species, whereas the species c/f's give a measure of stock size by species for each of the chosen gears.

The size of the Commercial Fishery in Virginia can be appreciated from the number of gear units licensed by category and their average catch 1929-77 (Table 1). Oyster tongs "in operation" average 2,529 units with a yearly average catch of nearly 6 million pounds of meat. Crab pots average 80,853 units landing nearly 22 million pounds per year. Other categories include 1,125 pound nets, 3,189 stake gill nets, 1,690 crab pound nets, 578 patent tongs, 557 crab trot lines, 579 fish fyke nets, and 2,333 eel pots. Purse seines, while few in number (27) landed an average of 218 million pounds of menhaden.

The specifics for each gear are given in the subsequent tables and graphs. Some gears have increased in importance while others have declined. Despite the trend to mechanization and larger boats, the Virginia fishery continues to depend heavily on the small operator working a series of lightweight gear from small boats. Oyster tonging is open to anyone with the desire to make a living from the water. Crab pots, fish pots, trot lines, and gill nets can be fished effectively from very small boats with only one or two people. Gears like dredges, patent tongs, haul seines, pound nets, and trawls require more substantial investments in vessels and machinery.

Pound nets, stake gill nets, and fyke nets, are "fixed gears". The sites are reserved for license holders that occupied that site before. To avoid losing the site, many fishermen license the gear without knowing if they will utilize it that year.*

* After 1975, the site had to be fished the previous year to be held. If the site wasn't fished, the license was open for anyone's renewal for 41 days (Dec. 1, to Jan. 10).

In periods of declining catch the gear (site) may not be productive enough to fish, yet the license is renewed. This aspect adds an unknown quantity of unproductive gear to the yearly totals, thus causing the average catch per gear per year to be below the actual average of gears in use.

Mobile gear doesn't require a reserved site, but many fishermen license several gear types, or several of one type in the anticipation of fishing them actively if the year is good. As the seasons change, many fishermen correspondingly change gear and tactics to capitalize on the best periods for each of the groups. They must have the appropriate license, so the tendency is to cover oneself in advance.

Another source of error in the yearly c/f's is the recreational component. If a person wants to set a gill net, trot line, or any gear to obtain seafood for the home table, he simply buys the appropriate license and uses it. In most cases the use will be limited and the catch will never show up in any records. However, if during some periods the catch is good, that person can sell his catch to fish houses. The degree of such gear use compared to the total licenses sold, or the amount of catch sold, is unknown.

Regular fishermen are defined as those that obtain at least one-half their total income from the water. Casual fishermen obtain less than half their income by fishing. The U.S. Fishery Digest makes this division, as does VMRC for Virginia. Since both categories contribute to the recorded commercial landings (including recreational fishermen that sell part of the catch), this gives averages that are far below those actually landed by regular fishermen. The resultant c/f using both regular and casual fishermen gives a value which shows the catch of an average fishermen, rather than for an average "full time" fishermen. If data were available to split the landings into yield by regular and yield by casual fishermen, yearly c/f's by group could be computed. The averages in all the tables incorporate this "non-use" or limited use" gear function and combine regular and

casual yield resulting in values that by themselves usually indicate poor return ; . If it is assumed the amount of unproductive gear in the fishery, or the amount of part-time usage by gear, has remained fairly stable through the years; then the average c/f's are a constant proportion to the actual average catch and they merely underestimate the catch in a typical gear. Since Virginia does not require effort reporting by the fishermen, the numbers for correction of this error source are unavailable.

The average catch per gear per year (by species), remains the only reasonable way to adjust landings records for the amount of gear in use. It gives a relative estimate of stock size independent of landings and therefore is the most useful indicator of productivity trends.

All illustrations were redrawn from Dumont and Sundstrom (1961)¹ with some modifications to increase clarity and perspective. Donna Rathbone and Kathy Spano assisted with gathering and reducing the commercial gear data. The report was typed by K. Spano. Thanks are extended to Bill Kelly and Tony Silvia of NMFS (Hampton) and James Wallace of VMRC for their help in providing data and understanding the problems. This report was prepared by Remington House under contract to EG & G Wareham, Mass. The analysis and conclusions are solely of the authors.

1. Dumont Wm. H. and G.T. Sundstrom. 1961. Commercial Fishing Gear of the United States. Fish and Wildlife Circular 109, U.S. Fish and Wildlife Service, Washington, D.C. 61 p.

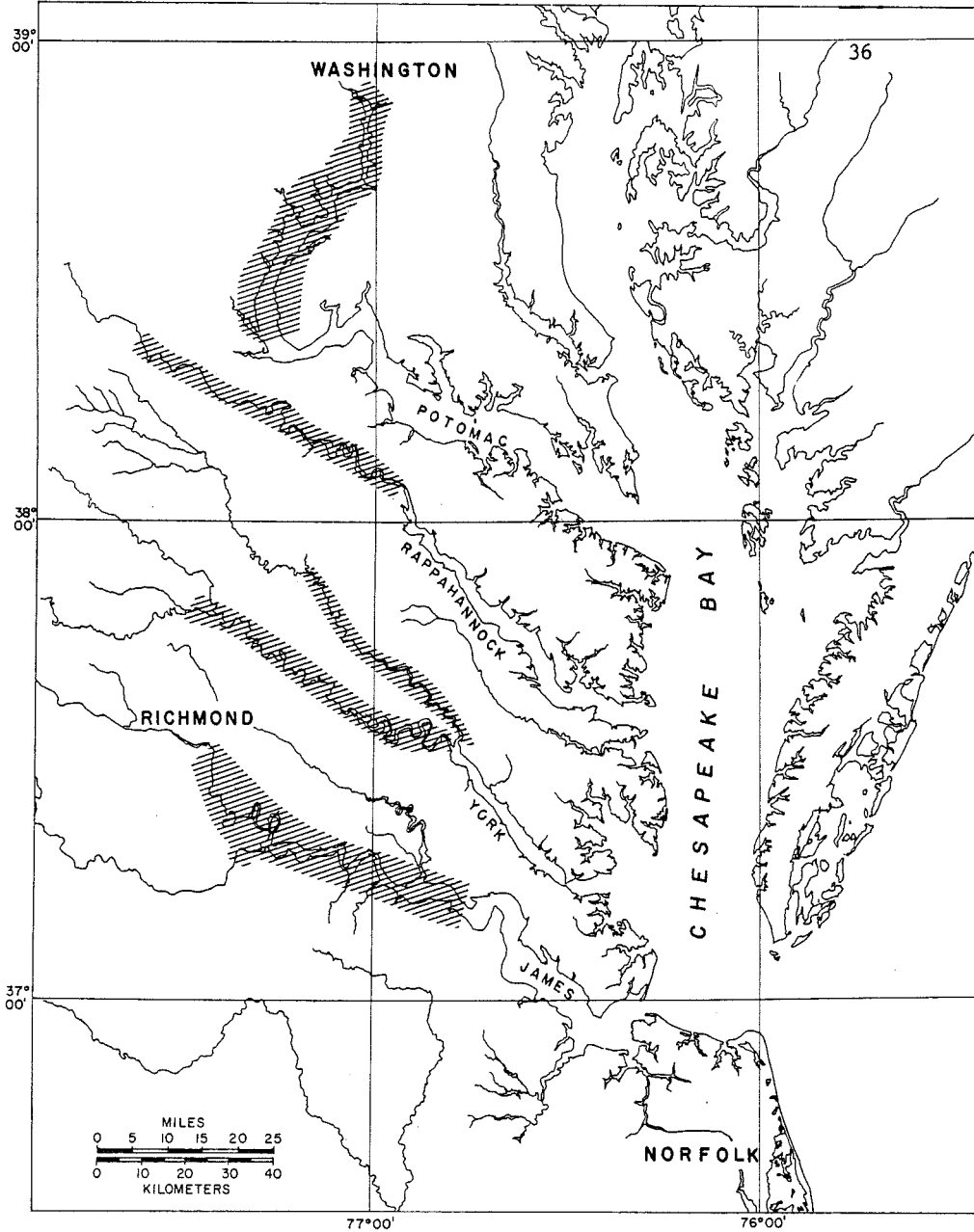
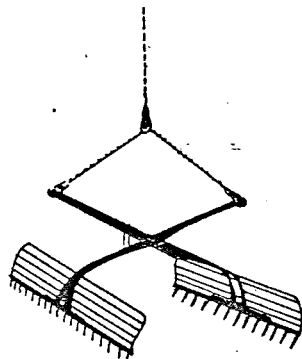


Figure 1. Map of lower Chesapeake Bay. Freshwater zones of rivers are shaded.

PATENT TONGS



Patent tongs are used for clams and oysters in deep water or shallow. The gear is operated from a small boat by the use of deck winches. They can be up to six feet wide and can weigh several hundred pounds.

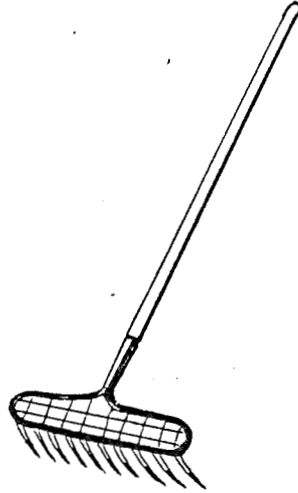
The patent tong fishery for hard clams fell off in gear units 1934-42, then rebounded steadily through the mid-sixties. After 1966, the fishery declined in size but returned to average by the mid-seventies. In every case as gear increased, c/f decreased; and when gear decreased the average catch increased (Fig. 2). The major peaks and valleys may reflect the influence of part-time fishermen entering the fishery when times are good and dropping out when catches are poor, but the striking inverse relationship considering all years and cross-over points suggest the fishery itself had a profound impact on the resources. From 1934-77 an average of 578 patent tongs worked the bottom, landing an average of 1,700 pounds of meats per year (Table 2).

Table 1. Summary of principal gears in the Virginia commercial fishery 1929 - 77, in thousands of pounds & dollars

Type of gear	1929 - 1977		Averages		
	Number licensed	Total pounds landed per year	Pounds landed per gear	Total value landed per year	Value landed per gear
Pantent Tongs	578	800	1.74	364	0.86
Clam Rake	452	241	1.55	111	0.59
Oyster Dredge	355	7,978	28.48	3,615	9.67
Oyster Tongs	2,529	5,928		1,971	
Crab Pound Net	1,690	184	0.64	154	0.12
Crab Pots	80,853	21,655	0.38	1,611	0.02
Crab Dredge	257	7,183	29.87	504	1.92
Crab Trot Line	557	7,913	16.99	235	0.98
Catfish Trot Line	60	94	2.18	14	0.25
Haul Seine	180	8,812	45.59	574	2.86
Fish Pound Net	1,125	51,977	60.63	1,755	2.16
Fyke Net	579	2,045	4.01	131	0.26
Fish Pots	3,838	893	0.35	94	0.03
Stake Gill Net	3,189	1,474	1.38	211	0.20
Drift Gill Net	758	1,933	3.45	217	0.37

Table 1. continued. Summary of principal gears in the Virginia commercial fishery 1929-77,
in thousands of pounds & dollars.

Type of gear	Number licensed	1929- 1977 Averages		Total value landed per year	Value landed per gear
		Total pounds landed per year	Pounds landed per gear		
Anchor Gill Net	654	1,253	4.58	179	0.37
Purse Seine	27	218,522	8,375.34	3,405	127.40
Eel Pots	2,333	266	0.13	51	0.03
Otter Trawls	51	12,905	314.39	1,193	24.56

CLAM RAKES

A long handled rake with special tines slightly recurved. It is used like any other rake, but only in shallow water. For clams the tines are several inches long. The gear can be used for oysters, but seldom is because hand tongs are preferred.

The clam rake fishery has paralleled the patent tong fishery with few exceptions. As the number of gear increased, average c/f decreased. By 1967 the number of gear had fallen to insignificance but the remaining active gear did very well thereafter (Fig 2). Clam rakes require very little investment in gear of boats, thus the fishery is open to anyone on a casual basis. As the clam bottoms became depleted through the fifties, the fishery (licenses) increased until the majority became convinced after 1960 to give it up. The average c/f began rising within several years, and supports the similar increasing c/f's found in the patent tong fishery. The rake fishery averaged 452 units landing an average 960 pounds per year 1929-77 (Table 3).

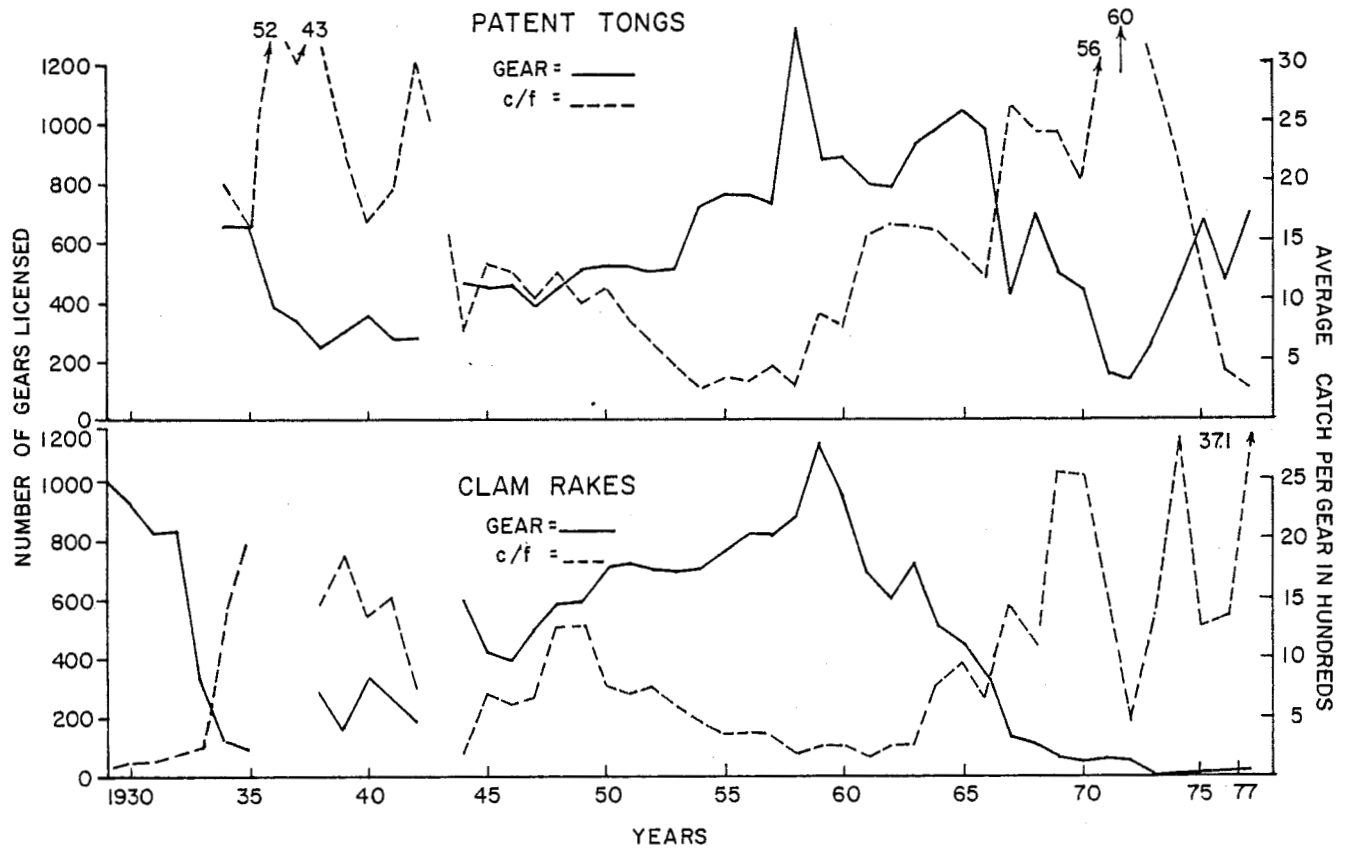


Figure 2. Operating units and average catch per gear for Patent Tongs and Clam Rakes.

Table 2. Patent tong commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

<u>Year</u>	<u>Number of gear units</u>	<u>Total pounds landed</u>	<u>Average catch per tong</u>	<u>Total value of catch</u>	<u>Average value per tong</u>
1929(1)	-	836	-	308	-
30	-	1,018	-	322	-
31	-	523	-	174	-
32	-	1,032	-	234	-
33	-	719	-	152	-
34	1,017	1,615	2.00	150	.15
35	660	1,042	1.58	222	.34
36	397	2,101	5.29	290	.73
37	353	1,096	3.11	175	.50
38	241	1,037	4.30	98	.41
39	308	706	2.29	115	.37
40	375	609	1.62	115	.31
41	282	521	1.85	111	.39
42	288	843	2.93	264	.92
44(2)	465	360	.77	141	.30
45	450	585	1.30	304	.68
46	469	596	1.27	399	.85
47	389	416	1.07	208	.54
48	453	555	1.23	277	.61
49	504	496	.98	208	.41
50	526	586	1.11	293	.56
51	525	438	.83	214	.41
52	491	311	.63	186	.38
53	516	233	.45	130	.25
54	721	206	.29	109	.15
55	761	240	.32	131	.17
56	759	236	.31	132	.17
57	721	265	.37	159	.22
58	1,231	336	.27	200	.16
59	873	771	.88	377	.43
60	883	684	.78	305	.35
61	795	1,214	1.53	559	.70
62	792	1,284	1.62	616	.78
63	931	1,520	1.63	721	.77
64	992	1,577	1.59	768	.77
65	1,050	1,461	1.39	778	.74
66	961	1,108	1.15	612	.64
67	421	1,103	2.62	624	1.48
68	619	1,472	2.38	832	1.34
69	492	1,188	2.42	746	1.52
70	437	907	2.08	593	1.36
71	160	899	5.62	696	4.35
72	139	838	6.03	713	5.13
73	263	738	2.81	691	2.63
74	430	944	2.20	883	2.05
75	633	751	1.19	704	1.11
76	444	183	.41	172	.39
77	644	188	.29	237	.37
Average	578	800	1.74	364	.86

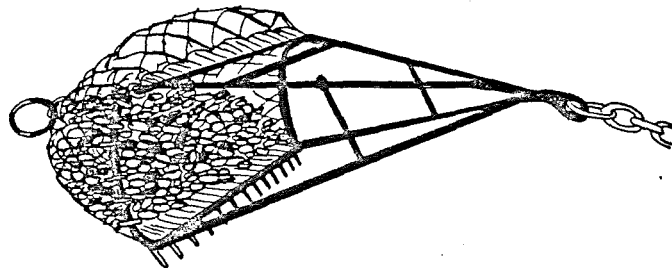
(1) No "number of gear" available for computations, 1929-33.

(2) 1943 data not available.

Table 3. Clam rake commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

Year	Number of gear units	Total pounds landed	Average catch per rake	Total value of catch	Average value per rake
1929	1,000	76	.08	28	.03
30	948	132	.14	44	.05
31	843	101	.12	36	.04
32	894	180	.20	41	.05
33	362	91	.25	23	.06
34	121	168	1.39	25	.21
35	86	170	1.98	41	.48
36	-	94	-	19	-
37	-	-	-	-	-
38	241	344	1.43	47	.20
39	165	308	1.87	51	.31
40	323	443	1.37	82	.25
41	255	392	1.54	82	.32
42	185	139	.75	49	.27
44(1)	593	117	.20	58	.10
45	425	294	.69	153	.36
46	384	236	.62	165	.43
47	509	336	.66	168	.33
48	573	724	1.26	362	.63
49	598	759	1.27	334	.56
50	704	547	.78	274	.39
51	725	510	.70	247	.34
52	686	499	.73	298	.43
53	673	400	.59	221	.33
54	714	311	.44	166	.23
55	780	269	.35	151	.19
56	824	309	.38	172	.21
57	819	289	.35	173	.21
58	873	175	.20	105	.12
59	1,137	313	.28	152	.13
60	945	265	.28	118	.13
61	684	115	.17	52	.08
62	591	151	.26	73	.12
63	738	216	.29	104	.14
64	520	384	.74	188	.36
65	439	405	.92	214	.49
66	358	222	.62	121	.34
67	129	182	1.41	102	.79
68	104	117	1.13	64	.62
69	58	148	2.55	88	1.52
70	55	138	2.51	91	1.66
71	75	117	1.56	88	1.17
72	66	27	.41	21	.32
73	8	11	1.38	11	1.38
74	8	23	2.88	21	2.63
75	12	15	1.25	14	1.17
76	13	17	1.31	19	1.46
77	14	52	3.71	60	4.29
Average	452	241	.96	111	.56

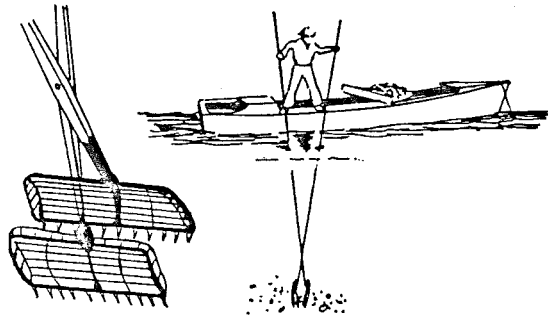
(1) 1943 data not available.

OYSTER DREDGE

Oyster dredges are a towed gear that operates by scraping the bottom. They are made from stout materials and can be 4-5 ft. across. The dredge is retrieved mechanically and dumped on a culling table. Undersize oysters are returned to the water.

The oyster dredge fishery averaged 355 operating units landing 7.9 million pounds of meats (total per year), from 1929-77. The average yearly return per dredge was 9.7 thousand dollars (unadjusted for inflation), and 28.5 thousand pounds. The operating units fell below 100 from 1937-44 as the c/f reached record levels (Fig 3). After the war, gear numbers increased to 632 by 1956, but the c/f fell correspondingly. Gear continued to increase to 1961 as the c/f continued its long term slide. The fishery remained healthy despite lower catches because oyster prices remained high as catch declined. MSX may have been the primary cause of the oyster decline, but Fig. 3 suggest the abundance of gear was putting extreme pressure on the remainder.

As c/f continued to decline through the late sixties and seventies, gear reduction followed. The active gear remaining showed a decreasing average return in dollars (Table 4), thus accelerating the process. After 1975 gear fell below 200 units, and c/f began to rise again to the levels of the early sixties.

OYSTER TONGS

Hang tongs operate like a pair of scissors. They are lowered open to the bottom and closed by counter action through the arms. They are limited to shallow water (10-15 ft). Used for oysters.

The pattern of the oyster tong fishery followed the oyster dredge fishery from 1935-45 but decreased after 1946 to 20 years of fairly steady gear numbers (Fig. 3). In the mid-sixties there was another peak in units during a depressed period of catch. As the fishery "de-gearred" 1965-77 the average catch per gear increased, suggesting less pressure on the resource or the concentration of the remaining gear on the best grounds. Virginia waters have supported an average of 2,529 tongers over the period landing an average 5.9 million pounds of meats worth an average 1.9 million dollars (Table 5). As with dredges, the tong fishery has showed decreasing catch with high gear numbers and stable or increasing catch will low gear numbers. The average catch per ton per year was 2.1 thousand pounds for 1924-77.

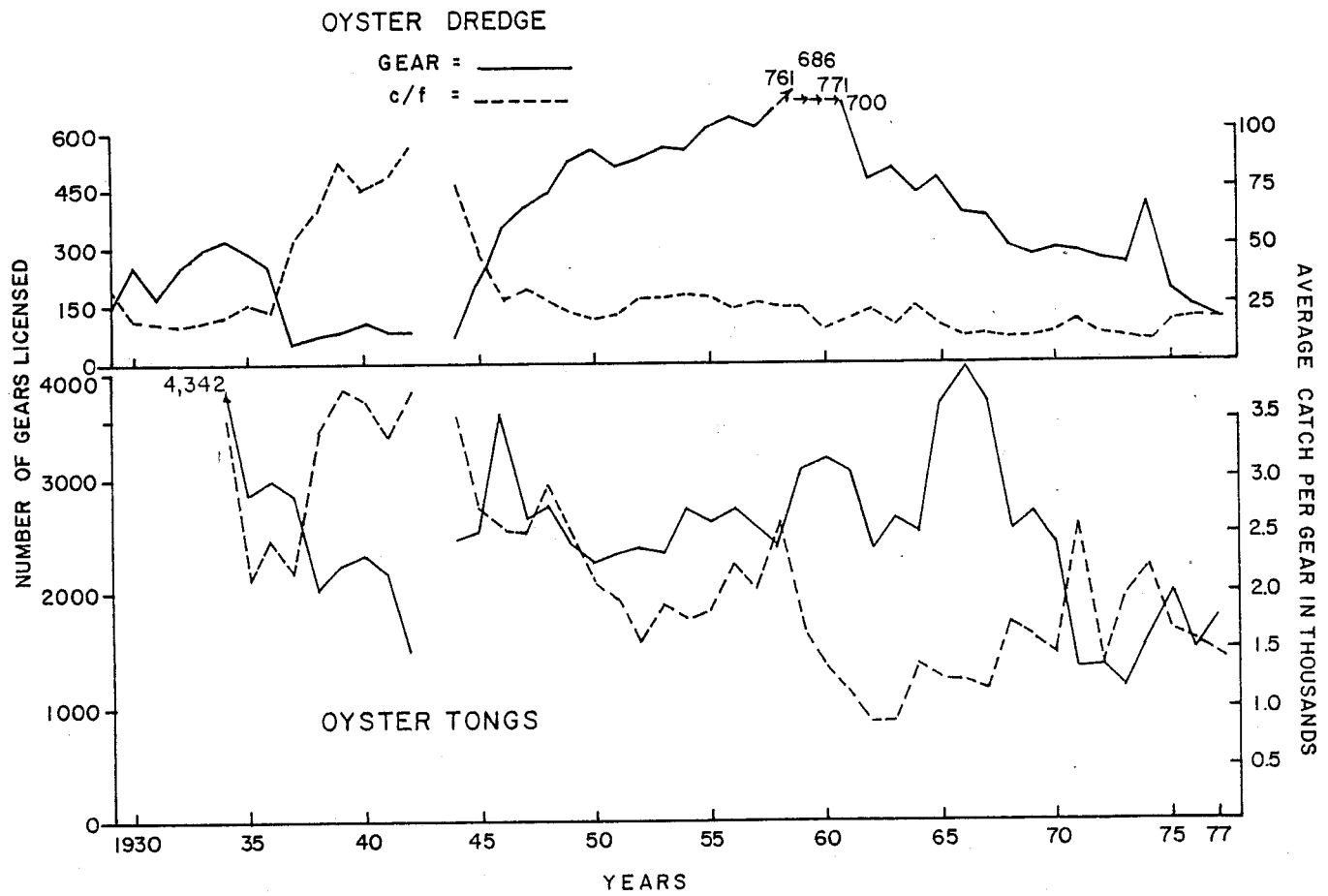


Figure 3. Operating units and average catch per gear for Oyster Dredges and Oyster Tongs.

Table 4. Oyster dredge commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

Year	Number of gear units	Total pounds landed	Average catch per dredge	Total value of catch	Average value per dredge
1929	150	5,115	34.10	704	4.69
30	256	4,606	17.99	560	2.19
31	164	2,892	17.63	240	1.46
32	256	4,167	16.28	309	1.21
33	298	5,043	16.92	383	1.29
34	316	6,304	19.95	459	1.45
35	290	7,123	24.56	525	1.81
36	247	5,666	22.94	457	1.85
37	53	2,802	52.87	215	4.06
38	67	4,475	66.79	353	5.27
39	72	6,325	87.85	529	7.35
40	92	6,887	74.86	633	6.88
41	84	6,643	79.08	829	9.87
42	78	7,226	92.64	1,460	18.72
44(1)	69	5,244	76.00	1,465	21.23
45	195	9,520	48.82	3,549	18.20
46	342	9,748	28.50	2,924	8.55
47	411	12,853	31.27	4,645	11.30
48	443	11,968	27.02	4,042	9.12
49	524	11,354	21.67	3,780	7.21
50	541	10,361	19.15	3,741	6.92
51	507	10,211	20.14	3,589	7.08
52	535	13,779	25.76	5,800	10.84
53	560	14,525	25.94	5,714	10.20
54	546	15,688	28.73	7,322	13.41
55	603	16,440	27.26	7,503	12.44
56	632	14,920	23.61	6,992	11.06
57	577	14,434	25.02	7,066	12.25
58	761	18,914	24.85	10,316	13.56
59	686	16,119	23.50	10,099	14.72
60	771	10,891	14.13	7,713	10.00
61	700	13,654	19.51	11,030	15.76
62	478	9,676	20.24	8,013	16.76
63	505	8,089	16.02	6,218	12.31
64	444	10,385	23.39	7,620	17.16
65	477	7,813	16.38	6,533	13.70
66	385	4,544	11.80	3,264	8.48
67	375	4,802	12.81	3,074	8.20
68	294	3,465	11.79	2,301	7.83
69	271	3,093	11.41	2,099	7.75
70	324	4,433	13.68	3,018	9.32
71	276	4,945	17.92	3,374	12.23
72	260	3,117	11.99	2,097	8.07
73	251	2,625	10.46	1,783	7.10
74	418	3,221	7.71	2,399	5.74
75	179	2,814	15.72	2,297	12.83
76	144	2,482	17.24	2,574	17.88
77	115	1,536	13.36	1,933	16.81
Average	355	7,978	28.48	3,615	9.67

(1) 1943 data not available.

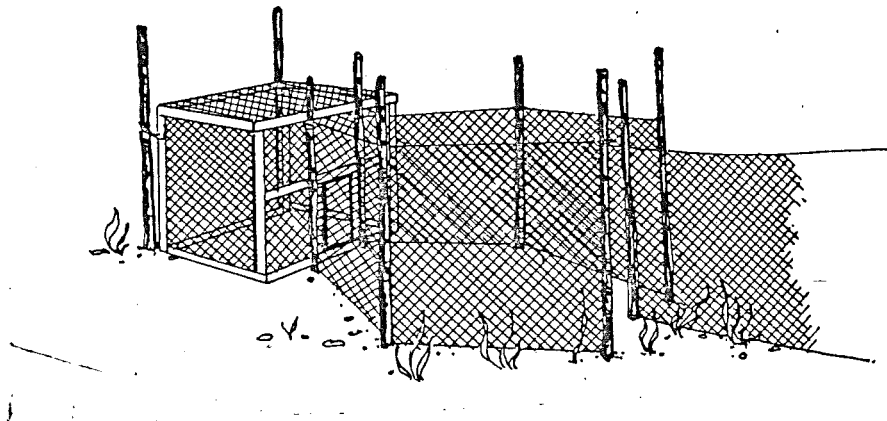
Table 5. Oyster tong commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

Year	Number of gear units	Total pounds landed	Average catch per tong	Total value of catch	Average value per tong
1929	-(1)	11,434	-	1,339	-
30	-	14,272	-	1,667	-
31	-	12,318	-	1,025	-
32	-	9,775	-	687	-
33	-	7,833	-	502	-
34	4,342	15,253	3.51	930	.21
35	2,889	6,151	2.13	397	.14
36	2,985	7,311	2.45	640	.21
37	2,877	6,281	2.18	434	.15
38	2,098	7,128	3.40	636	.30
39	2,210	8,282	3.75	656	.30
40	2,302	8,411	3.65	726	.32
41	2,176	7,357	3.38	1,052	.48
42	1,548	5,816	3.76	926	.60
44(2)	2,443	8,621	3.53	2,521	1.03
45	2,632	7,157	2.72	2,509	.95
46	3,519	9,068	2.58	2,696	.77
47	2,668	6,815	2.55	2,490	.93
48	2,770	8,097	2.92	2,650	.96
49	2,420	6,008	2.48	1,992	.82
50	2,276	4,789	2.10	1,689	.74
51	2,327	4,539	1.95	1,583	.68
52	2,451	3,902	1.59	1,709	.70
53	2,332	4,328	1.86	1,689	.72
54	2,715	4,790	1.76	2,163	.80
55	2,602	4,737	1.82	2,100	.81
56	2,700	5,966	2.21	2,738	1.01
57	2,597	5,253	2.02	2,569	.99
58	2,422	6,468	2.67	3,749	1.55
59	3,078	5,112	1.66	3,197	1.04
60	3,153	4,380	1.39	3,123	.99
61	3,060	3,437	1.12	2,850	.93
62	2,342	2,056	.88	1,705	.73
63	2,630	2,344	.89	1,827	.70
64	2,528	3,483	1.38	2,513	.99
65	3,614	4,529	1.25	3,554	.99
66	3,987	4,899	1.23	3,230	.81
67	3,622	4,266	1.18	2,885	.80
68	2,522	4,340	1.72	2,968	1.18
69	2,695	4,344	1.61	2,887	1.07
70	2,437	3,610	1.48	2,409	.99
71	1,350	3,496	2.59	2,136	1.58
72	1,366	1,898	1.39	1,144	.84
73	1,189	2,331	1.96	1,375	1.16
74	1,572	3,517	2.24	2,445	1.56
75	2,000	3,382	1.69	2,665	1.33
76	1,519	2,364	1.56	2,353	1.55
77	1,785	2,572	1.44	2,862	1.60
Average	2,529	5,928	2.13	1,971	.86

(1) No "number of gear" available of computations, 1929-33.

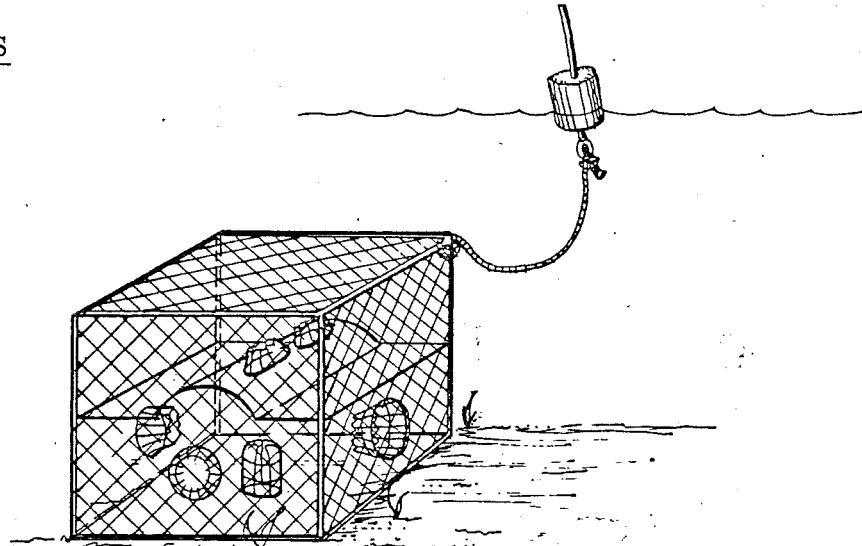
(2) 1943 data not available.

CRAB POUND NETS



Crab pound nets are set on the bottom in shallow water (3-6 ft) very close to the shore. The fence of leader runs to the shore. Blue crabs moving along the shore intercept the leader and swim toward the heart (pound) where they pass through a constriction and are trapped. The net is usually made from stiff wire that is often plastic coated.

The number of crab pound nets increased dramatically from 1945-70 as the c/f continued a long term decline after the late forties (Fig.4). The average number over the entire period was 1,690, landing an average 640 pounds worth 120 dollars per year. As the number of gear decreased after the mid-sixties, the c/f increased until the fishery expanded again in the early seventies, when once again the c/f fell to all time lows. Fishermen that tended crab pounds on a part-time basis continued to work several nets and marketed crabs at high value through the seventies. When the resource was at its peak, the average net landed 600 to 2,000 pounds per year (Table 6).

CRAB POTS

Crab pots are used to catch blue crabs. They are made from galvanized chicken wire with conical entry ports on the four sides. The pots are baited from the bottom with dead fish. To harvest the catch the pots are lifted to the surface and the crabs are dumped out the top opening. They are rebaited and thrown overboard. A simple boat can tend up to a hundred crab pots a day.

Crab pots have been the mainstay of the Virginia crab fishery, averaging 80 thousand in number, and 21 million pounds per year worth an average 1.6 million dollars (Table 7). The fishery has expanded continuously since 1940 (Fig. 4) while the average catch per pot has fallen steadily. The cross over point for pots occurred in 1956 compared to 1953 for crab pound nets. Both gears show the inverse relationship of gear number and c/f , but the pot fishery is the most striking example. An expanding fishery (ingear) during a period of decreasing c/f must depend on increasing market prices in excess of inflation, or a greater percentage of casual fishermen that can afford to fish at lower return, or both. The crab fishery appears to have depressed itself through greater fishing pressure than the resource could maintain with stability.

Blue crab total landings increased in Virginia from 1955-66, then began a slide through the late seventies, (see species records

in next section). The data herein suggest the resource was into a long term decline long before that, but that greater fishing pressure held landings up. This gave the false impression the resource was not in trouble, when in fact the Maximum Sustained Yield may have been exceeded, leading to the inevitable decline.

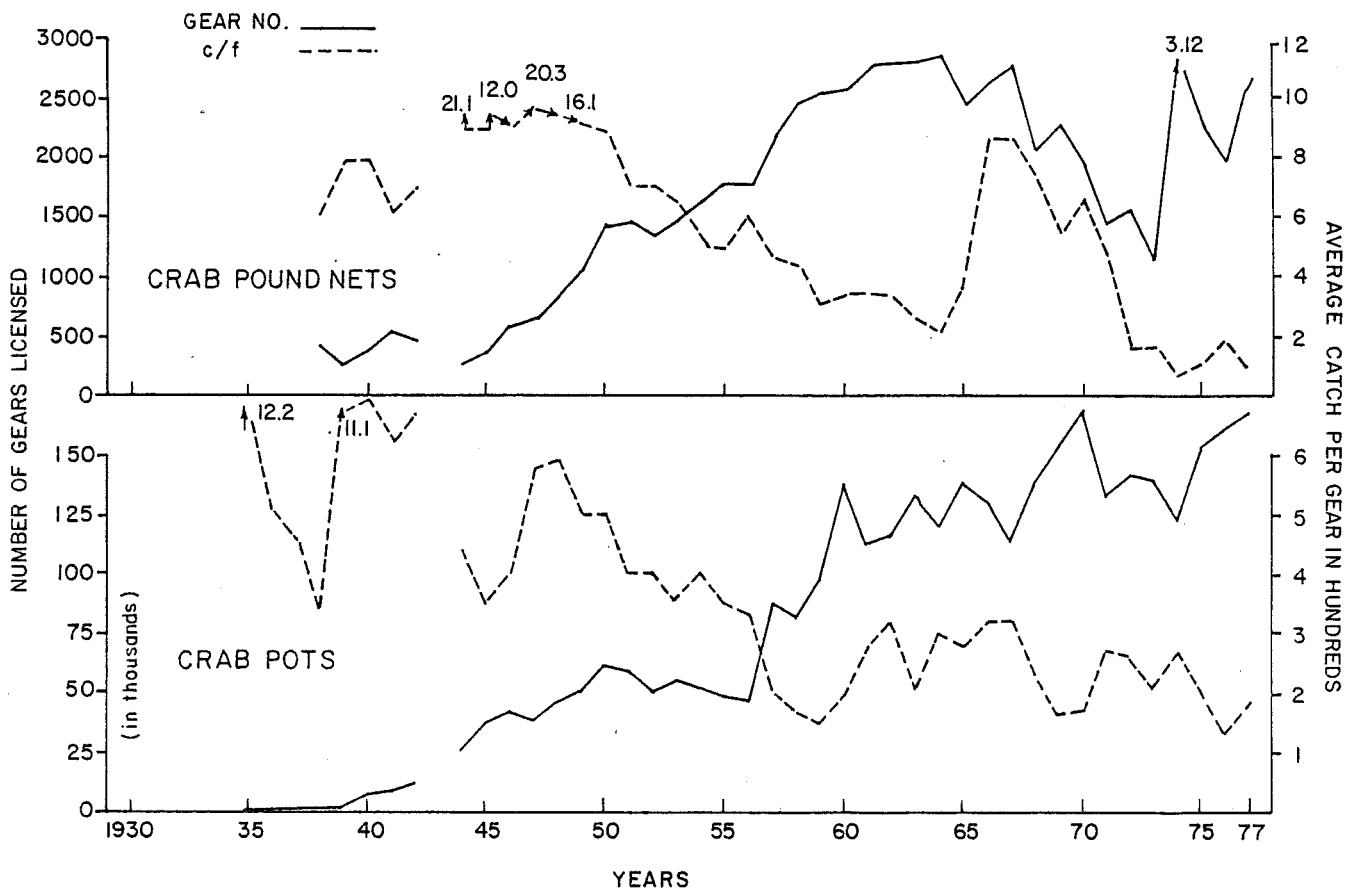


Figure 4. Operating units and average catch per gear for Crab Pound Nets and Crab Pots.

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Table 6. Crab pound net commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

Year	Number of gear units	Total pounds landed	Average catch per net	Total value of catch	Average value per net
1929	-(1)	6	-	1	-
30	-	-	-	-	-
31	-	-	-	-	-
32	-	-	-	-	-
33	-	-	-	-	-
34	-	-	-	-	-
35	-	-	-	-	-
36	-	1	-	1	-
37	-	-	-	-	-
38	408	256	.63	29	.07
39	299	231	.77	10	.03
40	388	300	.77	18	.05
41	538	337	.63	44	.08
42	479	335	.70	23	.05
44(2)	242	511	2.11	112	.46
45	319	383	1.20	109	.34
46	593	556	.94	176	.30
47	634	1,285	2.03	313	.49
48	809	1,306	1.61	254	.31
49	1,051	939	.89	155	.15
50	1,406	1,220	.87	152	.11
51	1,447	994	.69	161	.11
52	1,322	900	.68	117	.09
53	1,453	931	.64	143	.10
54	1,592	883	.56	129	.08
55	1,793	952	.53	155	.09
56	1,783	1,067	.60	163	.09
57	2,182	996	.46	261	.12
58	2,441	1,067	.44	179	.07
59	2,535	843	.33	208	.08
60	2,550	908	.36	216	.09
61	2,787	1,009	.36	235	.08
62	2,787	969	.35	258	.09
63	2,799	654	.23	159	.06
64	2,839	600	.21	182	.06
65	2,477	896	.36	261	.11
66	2,605	2,270	.87	261	.10
67	2,798	2,379	.85	336	.12
68	2,098	1,527	.73	242	.12
69	2,279	1,227	.54	175	.08
70	1,940	1,283	.66	113	.06
71	1,436	681	.47	136	.10
72	1,548	253	.16	105	.07
73	1,134	179	.16	81	.07
74	3,122	173	.06	83	.03
75	2,265	250	.11	122	.05
76	1,976	362	.18	249	.13
77	2,754	242	.09	181	.07
Average	1,690	784	.64	154	.12

(1) No "number of gear" available for computations, 1929-37.

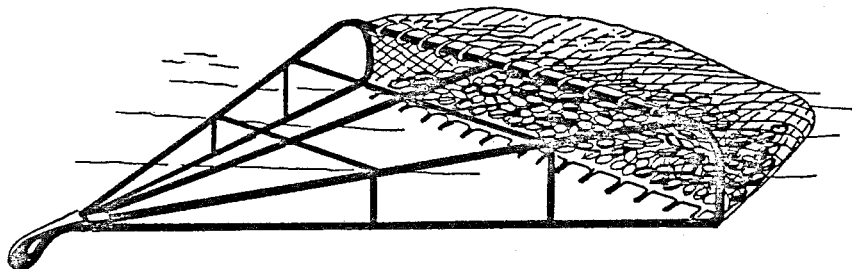
(2) 1943 data not available.

Table 7. Crab pot commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

<u>Year</u>	<u>Number of gear units</u>	<u>Total pounds landed</u>	<u>Average catch per pot</u>	<u>Total value of catch</u>	<u>Average value per pot</u>
1929	-(1)	-	-	-	-
30	-	-	-	-	-
31	-	-	-	-	-
32	-	-	-	-	-
33	-	-	-	-	-
34	-	-	-	-	-
35	46	56	1.22	1	.02
36	275	141	.51	5	.02
37	1,060	490	.46	13	.01
38	740	252	.34	4	.01
39	1,120	1,245	1.11	30	.03
40	7,190	5,099	.71	94	.01
41	9,389	5,787	.62	171	.02
42	12,001	8,039	.67	235	.02
44(2)	25,550	11,208	.44	608	.02
45	37,800	13,339	.35	879	.02
46	42,300	16,880	.40	1,093	.03
47	37,900	22,012	.58	1,009	.03
48	46,650	27,322	.59	1,428	.03
49	51,400	25,434	.50	1,163	.02
50	61,500	30,525	.50	1,032	.02
51	58,650	23,199	.40	740	.01
52	51,350	20,698	.40	717	.01
53	55,850	19,848	.36	735	.01
54	53,100	21,099	.40	767	.01
55	49,250	17,424	.35	801	.02
56	45,400	14,993	.33	839	.02
57	88,255	18,984	.22	1,143	.01
58	82,130	13,567	.17	736	.01
59	98,385	14,938	.15	1,126	.01
60	137,075	27,442	.20	1,434	.01
61	113,995	31,966	.28	1,487	.01
62	115,183	37,127	.32	1,831	.02
63	132,100	27,709	.21	1,638	.01
64	120,680	35,949	.30	2,578	.02
65	138,816	39,283	.28	3,058	.02
66	130,972	41,429	.32	2,593	.02
67	114,903	36,367	.32	1,899	.02
68	138,805	31,294	.23	3,596	.03
69	153,045	24,003	.16	2,547	.02
70	168,275	28,514	.17	1,734	.01
71	133,450	35,619	.27	2,896	.02
72	140,475	36,403	.26	2,958	.02
73	136,785	28,333	.21	3,107	.02
74	123,024	33,266	.27	3,593	.03
75	153,554	30,658	.20	4,479	.03
76	160,357	20,022	.13	5,000	.03
77	167,025	31,563	.19	5,863	.04
Average	80,853	21,655	.38	1,611	.02

(1) Crab pots not used during 1929-34.

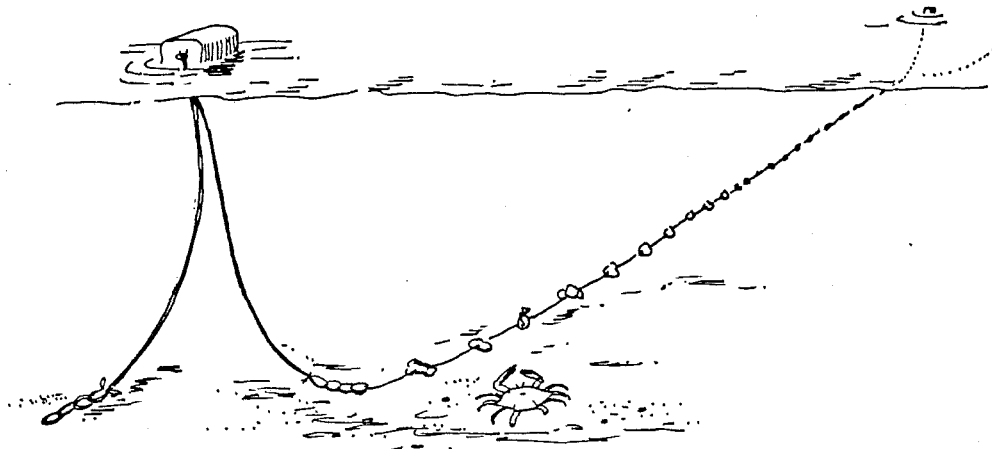
(2) 1943 data not available.

CRAB DREDGES

Crab dredges are similar to oyster dredges except for overall size and weight. The gear is used primarily to capture crabs hibernating in the bottom mud during winter. The weight and size of the gear require substantial deck equipment for retrieval.

The dredge fishery had its initial expansion from 1929-38, with a rapid fall in dredge c/f. After the War the fishery rapidly expanded, continuing until 1965. In each period when gear numbers rose, c/f fell, and when gear numbers fell, the average c/f increased. After 1960 the fishing gear declined somewhat while the c/f held strong though very erratic. The dredge fishery operates in the colder months from medium size vessels in the Chesapeake Bay (mainly). The average catch per dredge from 1960-77 was without definite trend (Fig. 5). Since the total number of dredges declined 1960-77 while average catch remained "stable", this could indicate the remaining gear was used more efficiently or simply that some part time fishermen dropped out. The resource was declining after 1965 as measured by the other crab gear that capture the summer stock of crabs. The average c/f per dredge was 29.8 thousand pounds worth an average 1.9 thousand dollars for 1929-77 (Table 8).

CRAB TROT LINES



Crab trot lines are simply long, stiff cords with bait hooks spaced every several feet. The crabs attack the bait and hang on as the line is lifted. As the line passes over a side roller (on the boat) they let go, but are scooped up with a small hand net. This gear can be used from very small boats and requires a low investment.

The 49 year trend in trot lines for crabs has been downward, with the largest fall during the War years. Average catch remained stable from 1930-56, fell off somewhat, then increased to record highs after 1961 (Fig. 5). The late sixties peak in c/f paralleled increased average catches of the dredge, pound net, and pot fishery. After 1972, the number of trot lines operating became insignificant (Table 9). The average catch per line (per year) was 16.9 thousand pounds. The trot line fishery declined in gear as the other crab gears increased in number. This indicates serious crab fishermen put their effort into pots, dredges and pound nets. Trot lines are therefore the least likely to reflect the state of the resource.

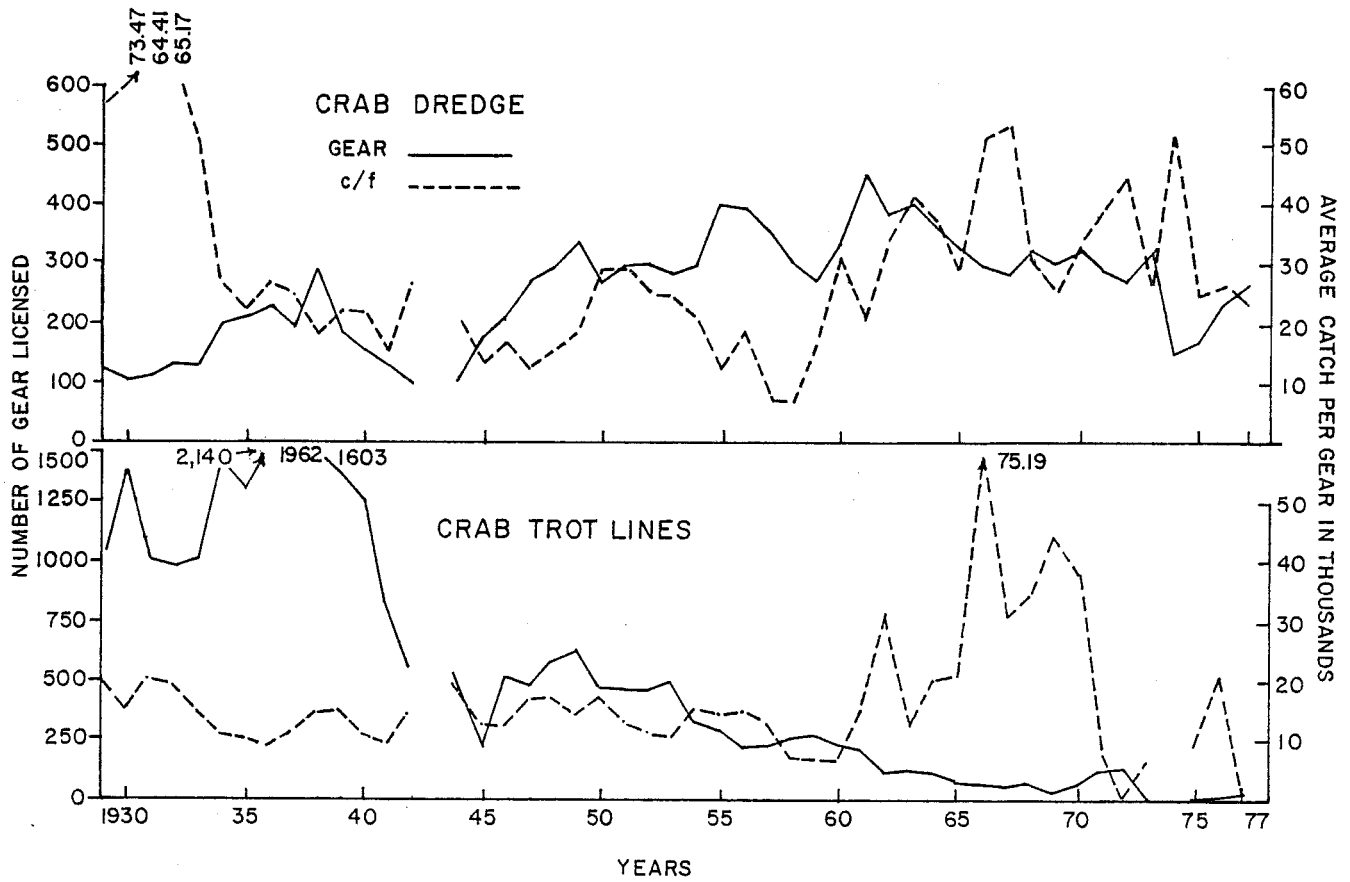


Figure 5. Operating units and average catch per gear for Crab Dredges and Crab Trot Lines.

Table 8. Crab dredge commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

Year	Number of gear units	Total pounds landed	Average catch per dredge	Total value of catch	Average value per dredge
1929	124	7,073	57.04	178	1.44
30	102	7,494	73.47	149	1.46
31	112	7,214	64.41	100	.89
32	126	8,211	65.17	104	.83
33	130	6,555	50.42	111	.85
34	200	5,597	27.99	172	.86
35	211	4,792	22.71	176	.83
36	232	6,260	26.98	183	.79
37	198	4,903	24.76	175	.88
38	296	5,392	18.22	148	.50
39	182	4,088	22.46	115	.63
40	160	3,534	22.09	141	.88
41	134	2,117	15.80	99	.74
42	100	2,665	26.65	99	.99
44 ⁽¹⁾	105	2,178	20.74	193	1.84
45	168	2,260	13.45	139	.83
46	208	3,573	17.18	214	1.03
47	265	3,436	12.97	362	1.37
48	288	4,518	15.69	456	1.58
49	339	6,407	18.90	487	1.44
50	268	7,682	28.66	606	2.26
51	294	8,692	29.57	596	2.03
52	297	7,613	25.63	501	1.69
53	283	7,098	25.08	693	2.45
54	294	6,238	21.22	381	1.30
55	401	5,172	12.90	470	1.17
56	392	7,177	18.31	716	1.83
57	359	2,801	7.80	317	.88
58	303	2,271	7.50	189	.62
59	275	4,644	16.89	348	1.27
60	337	10,545	31.29	628	1.86
61	450	9,083	20.18	403	.90
62	384	13,033	33.94	598	1.56
63	406	16,525	40.70	894	2.20
64	362	13,135	36.29	797	2.20
65	324	9,434	29.12	667	2.06
66	298	15,244	51.15	753	2.53
67	283	14,978	52.93	980	3.46
68	320	9,873	30.85	1,011	3.16
69	300	7,695	25.65	755	2.52
70	324	10,559	32.59	593	1.83
71	285	10,962	38.46	854	3.00
72	273	12,349	45.23	1,135	4.16
73	320	8,881	27.75	1,258	3.93
74	158	8,084	51.17	937	5.93
75	173	4,469	25.83	740	4.28
76	231	6,158	26.66	1,283	5.55
77	265	6,144	23.19	1,292	4.88
Average	257	7,183	29.87	504	1.92

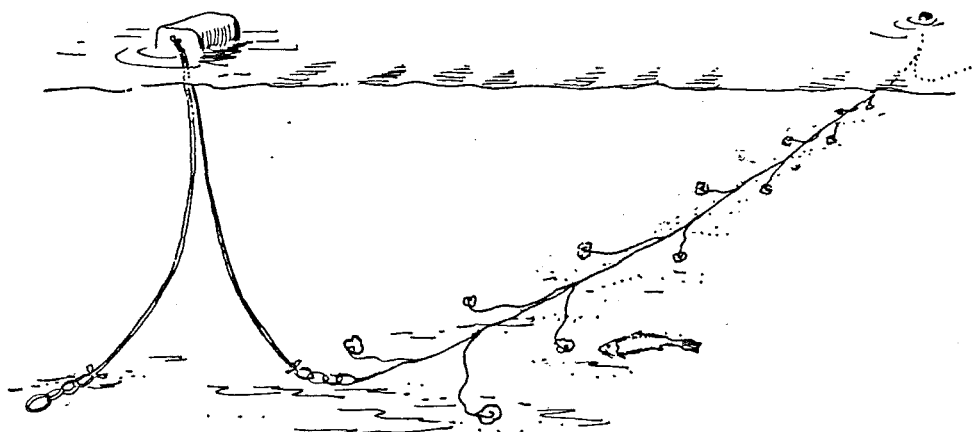
(1) 1943 data not available.

Table 9. Crab trot line commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

<u>Year</u>	<u>Number of gear units</u>	<u>Total pounds landed</u>	<u>Average catch per trot line</u>	<u>Total value of catch</u>	<u>Average value per trot line</u>
1929	1,064	21,452	20.16	354	.33
30	1,386	20,113	14.51	373	.27
31	1,094	21,355	19.52	284	.26
32	994	18,302	18.41	182	.18
33	1,075	17,047	15.86	170	.16
34	1,437	16,862	11.73	287	.20
35	1,304	14,686	11.26	308	.24
36	2,140	19,548	9.14	386	.18
37	1,962	22,334	11.38	379	.19
38	1,603	22,940	14.31	361	.23
39	1,390	21,437	15.42	359	.26
40	1,269	14,579	11.49	285	.23
41	844	7,919	9.38	220	.26
42	558	7,905	14.17	226	.41
44 ⁽¹⁾	542	10,640	19.63	616	1.14
45	227	3,006	13.24	193	.85
46	511	6,449	12.62	411	.80
47	493	9,099	18.46	426	.86
48	586	11,169	19.06	585	1.00
49	634	8,976	14.16	620	.98
50	465	8,342	17.94	281	.60
51	465	5,971	12.84	196	.42
52	457	5,363	11.74	192	.42
53	485	5,510	11.36	208	.43
54	331	5,275	15.94	193	.58
55	299	4,393	14.69	204	.68
56	236	3,609	15.29	259	1.10
57	241	3,188	13.23	197	.82
58	252	1,887	7.49	98	.39
59	255	1,720	6.75	126	.49
60	248	1,682	6.78	86	.35
61	210	3,086	14.70	147	.70
62	117	3,593	30.71	178	1.52
63	145	1,979	13.65	107	.74
64	130	2,608	20.06	173	1.33
65	94	1,907	20.29	144	1.53
66	72	5,414	75.19	319	4.43
67	60	1,852	30.87	92	1.53
68	75	2,603	34.71	299	3.99
69	47	2,073	44.11	202	4.30
70	66	2,570	38.94	152	2.30
71	134	1,124	8.39	87	.65
72	146	155	1.06	16	.11
73	6	42	7.00	7	1.17
74	-	-	-	-	-
75	6	53	8.83	7	1.17
76	5	109	21.80	27	5.40
77	15	1	.07	1	.07
Average	557	7,913	16.99	235	.98

(1) 1943 data not available.

TROT LINES with HOOKS

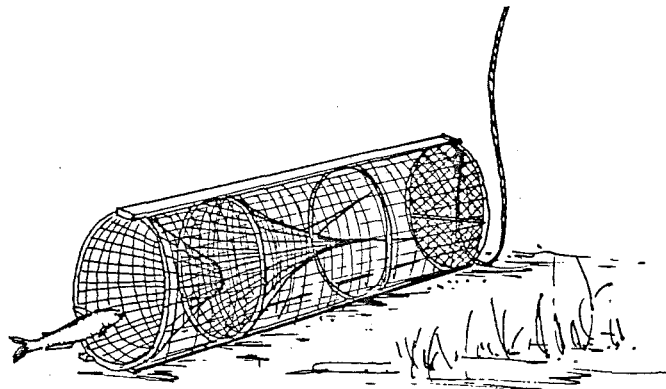


Catfish trot lines are in widespread use throughout Virginia rivers for the capture of catfish and carp. Hooks with short leaders are attached to a long, stout line. The hooks are baited with catfish bait, and the line is generally set overnight with several jugs on each end. The fish swallow the bait and are retrieved in the morning. Catfish trot lines are a low investment gear.

Trot lines for catfishes and bullheads have not been a major Virginia gear, although in some years over 200 thousand pounds were landed (Table 10). The average catch per line was 2.18 thousand pounds per year in the freshwater zones of the rivers. Each line was worth an average of 250 dollars per year in dockside return to the fishermen. The c/f's experienced a long term decline from the mid-fifties to the late seventies. As with several others gears, when catches were good the fishery built up in gear and average landings fell off soon after. The mid-seventies had more catfish trot lines operating than any other periods (Fig. 6).

The catfish fishery is covered in detail in the next section, with c/f's of all the major gears given.

FISH POTS



Fish pots are usually made from wire or thin wooden slats. The baited gear is left unattended, and fish that enter the funnel-shaped opening become trapped within the fish pot. The Virginia catfish fishery depends heavily on this gear in the rivers. Fish pots are a low investment gear and several dozen can be tended by a single fisherman from a small boat.

Fish pots capture a host of species depending on where and how set. In the fresh water zones the primary catch is catfish, bullheads, and carp. Eels are also recorded in the general catch and sea bass are caught in the marine zones. The data presented in Table 11 include all finfish, and the average c/f is plotted against pot number in Figure 6. The pot catch for catfish and eels is presented separately in the next section. The major trends of Figure 6 are due to the catfish component, which shows a definite decline in c/f in the fishery continued to expand. The decline in c/f contrasts sharply with the Statewide data for total landings of catfish, which show a fairly steady period of catch from 1950-70 and only moderate decline in the resource. The average catch per pot was 350 pounds per year worth 30 dollars from 1935-77 (Table 11).

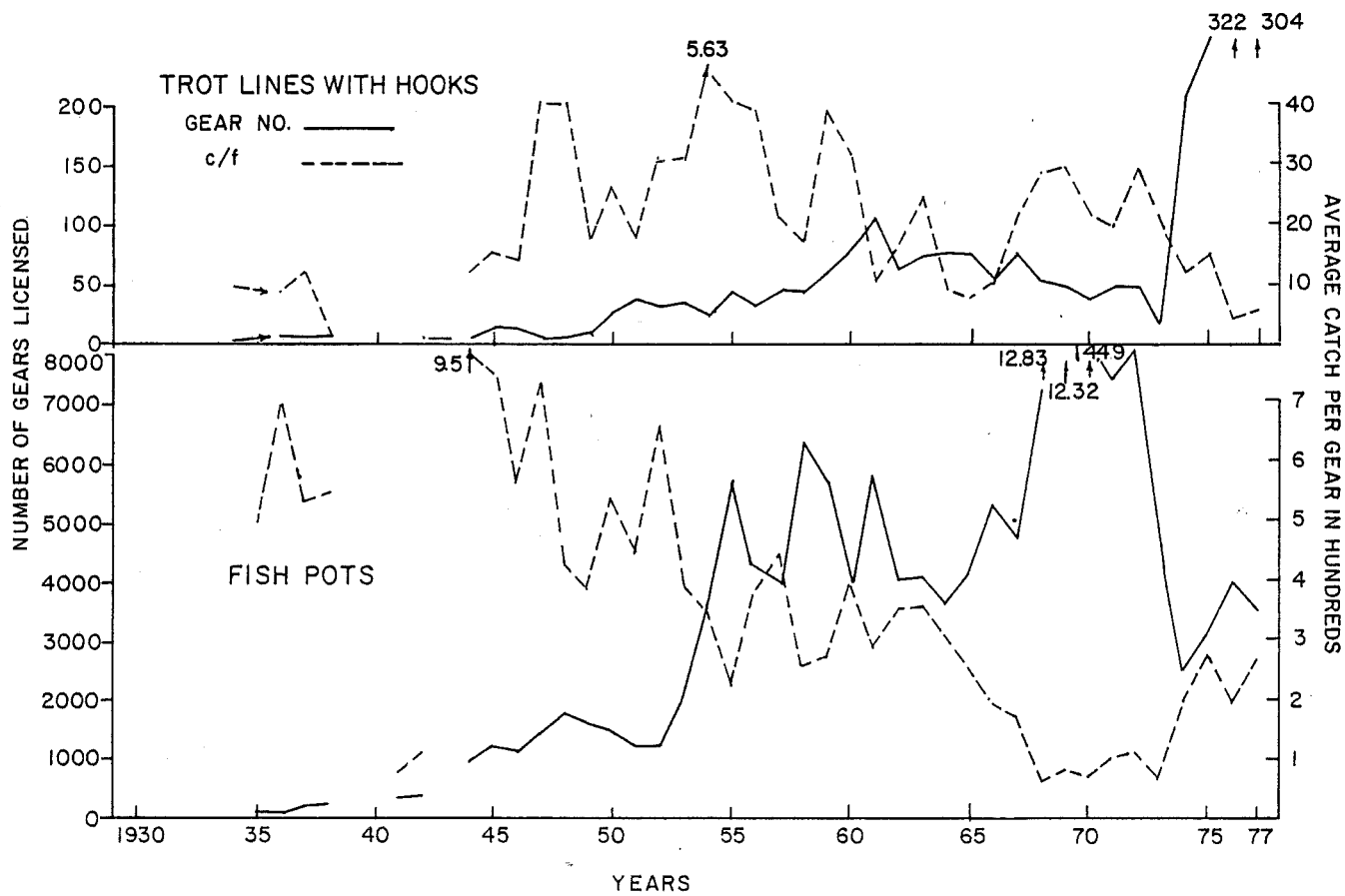


Figure 6. Operating units and average catch per gear for Trot Lines with Hooks, and Fish Pots.

Table 10. Catfish trot line commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

<u>Year</u>	<u>Number of gear units</u>	<u>Total pounds landed</u>	<u>Average catch per trot line</u>	<u>Total value of catch</u>	<u>Average value per trot line</u>
1929	-(1)	-	-	-	-
30	-	-	-	-	-
31	-	-	-	-	-
32	-	-	-	-	-
33	-	-	-	-	-
34	1	1	1.00	1	1.00
35	-	-	-	-	-
36	8	7	.88	1	.13
37	5	6	1.20	1	.20
38	6	2	.33	1	.17
39	-	-	-	-	-
40	-	-	-	-	-
41	-	-	-	-	-
42	4	13	3.25	1	.25
44(2)	5	6	1.20	1	.20
45	12	42	3.50	4	.33
46	11	16	1.46	1	.09
47	7	28	4.00	2	.29
48	3	12	4.00	1	.33
49	10	17	1.70	1	.10
50	24	62	2.58	6	.25
51	38	70	1.84	6	.16
52	30	91	3.03	6	.20
53	33	110	3.33	8	.24
54	24	135	5.63	10	.42
55	41	168	4.10	10	.24
56	31	120	3.87	7	.23
57	43	90	2.09	7	.16
58	42	70	1.67	6	.14
59	58	222	3.83	15	.26
60	76	239	3.15	16	.21
61	104	105	1.01	7	.07
62	58	98	1.69	7	.12
63	71	166	2.34	11	.16
64	77	69	.90	5	.07
65	72	58	.81	6	.08
66	51	51	1.00	6	.12
67	72	87	1.21	12	.17
68	51	111	2.18	16	.31
69	48	135	2.81	18	.38
70	38	112	2.95	17	.45
71	45	98	2.18	14	.31
72	45	85	1.89	13	.29
73	18	51	2.83	9	.50
74	203	242	1.19	53	.26
75	250	361	1.44	114	.46
76	322	128	.40	58	.18
77	304	178	.59	50	.16
Average	60	94	2.18	14	.25

(1) Catfish trot lines not used during 1929-33, 1935, 1939-41.

(2) 1943 data not available.

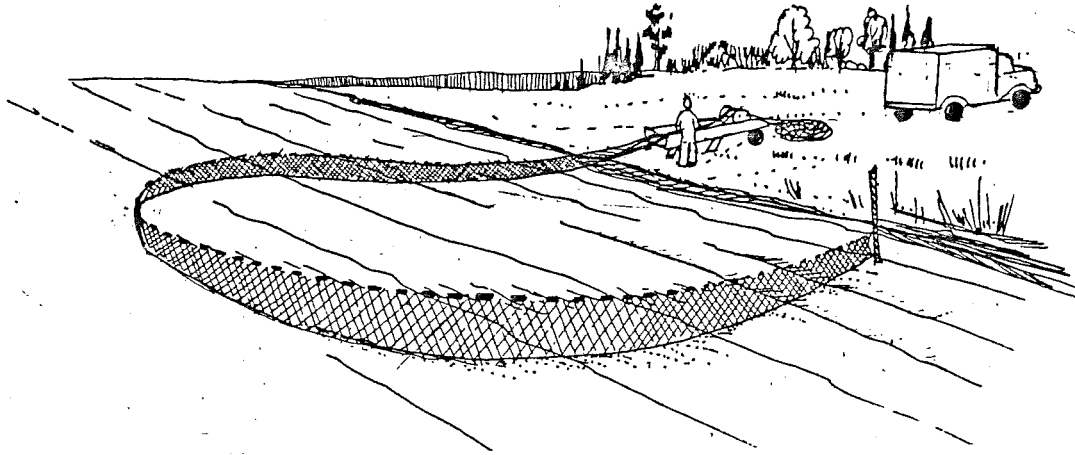
Table 11. Fish pot commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

Year	Number of gear units	Total pounds landed	Average catch per pot	Total value of catch	Average value per pot
1929	-(1)	-	-	-	-
30	-	-	-	-	-
31	-	-	-	-	-
32	-	-	-	-	-
33	-	-	-	-	-
34	-	-	-	-	-
35	141	72	.51	2	.01
36	131	93	.71	3	.02
37	221	119	.54	5	.02
38	245	134	.55	6	.02
39	-	-	-	-	-
40	-	-	-	-	-
41	385	29	.08	2	.01
42	423	45	.11	3	.01
44(2)	1,000	947	.95	96	.10
45	1,233	944	.77	85	.07
46	1,167	665	.57	53	.05
47	1,410	1,030	.73	82	.06
48	1,701	728	.43	51	.03
49	1,628	633	.39	43	.03
50	1,544	836	.54	75	.05
51	1,486	672	.45	52	.04
52	1,253	822	.66	55	.04
53	1,990	773	.39	56	.03
54	3,580	1,241	.35	91	.03
55	5,607	1,287	.23	82	.02
56	4,287	1,626	.38	109	.03
57	3,982	1,789	.45	146	.04
58	6,327	1,617	.26	137	.02
59	5,648	1,577	.28	114	.02
60	3,913	1,567	.40	108	.03
61	5,740	1,643	.29	124	.02
62	4,027	1,404	.35	108	.03
63	4,091	1,489	.36	115	.03
64	3,686	1,351	.37	101	.03
65	4,137	1,051	.25	107	.03
66	5,279	1,007	.19	136	.03
67	4,835	802	.17	108	.02
68	12,830	806	.06	126	.01
69	12,332	995	.08	161	.01
70	14,490	1,031	.07	221	.02
71	7,404	704	.10	90	.01
72	7,902	885	.11	147	.02
73	4,280	293	.07	50	.01
74	2,582	527	.20	117	.05
75	3,042	816	.27	197	.07
76	3,975	734	.19	170	.04
77	3,580	936	.26	219	.06
Average	3,838	893	.35	94	.03

(1) Fish pots not used during 1929-34 and 1939-40.

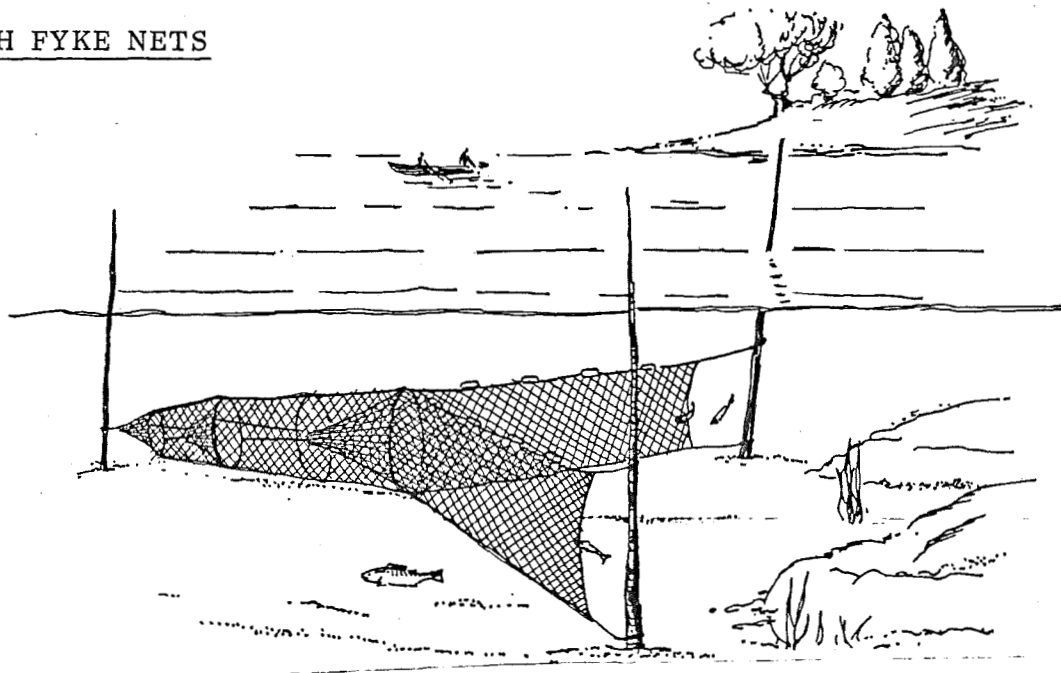
(2) 1943 data not available.

HAUL SEINES



Haul seines are used along gradually sloping shores with smooth bottoms. The net is set from the shore by using a boat to pull the fence of mesh to form a large semi-circle. To retrieve the catch, both ends are drawn together and a winch is used to haul the net to the shore. The catch is scooped out and into trucks. This gear requires special seining sites, equipment, and machinery. Thousands of pounds can be landed per haul.

The average number of licensed haul seines in Virginia was 180 from 1929-77. Each gear captured an average of 46 thousand pounds worth an average 2.8 thousand dollars per year (Table 12). The fishery expanded from 1929-50, then began a long term decline into the seventies (Fig. 7). The average c/f and the gear number trend quite closely, but generally when gear was up average catch was down. The gear has depended on striped bass, spot, croaker, grey trout and the miscellaneous species. Since several of these reached a State peak in the mid-sixties, and the gear number was declining over the same period, the fall in haul seine c/f is probably not related to the overuse of this gear, but to a decline in stock of its primary species. When croaker, grey trout, and spot became abundant in the mid-seventies, haul seines did not experience high catches like the pound nets did, but they did reflect the resource size, (see next section).

FISH FYKE NETS

Fyke nets resemble small submerged pound nets and are designed for use in rivers. This gear may be set with a leader to shallow water, but more commonly it is set offshore on the river bottom. Fyke nets are often baited (pound nets are not) and fish are led along converging wings of the net through a constriction and into the heart. Catfish and carp are the primary species captured.

This multispecies gear captured an average of 4 thousand pounds per year, (per net) worth 260 dollars dockside over the 1929-77 period (Table 13). The total number of units has fallen appreciably from the three major peaks (Fig. 7). The trend since 1930 has been downward, until by the mid seventies only 150 units were licensed. The average c/f (all species combined) rose from per War levels to a fairly steady period from 1944-54, while the units were expanding. As the units decreased in the fifties and sixties, c/f trended upward until the big crash of 1971. The alewife, which had traditionally made up 30 to 50 % of the fyke net catch, declined Statewide during these years to an insignificant component of the commercial catch.

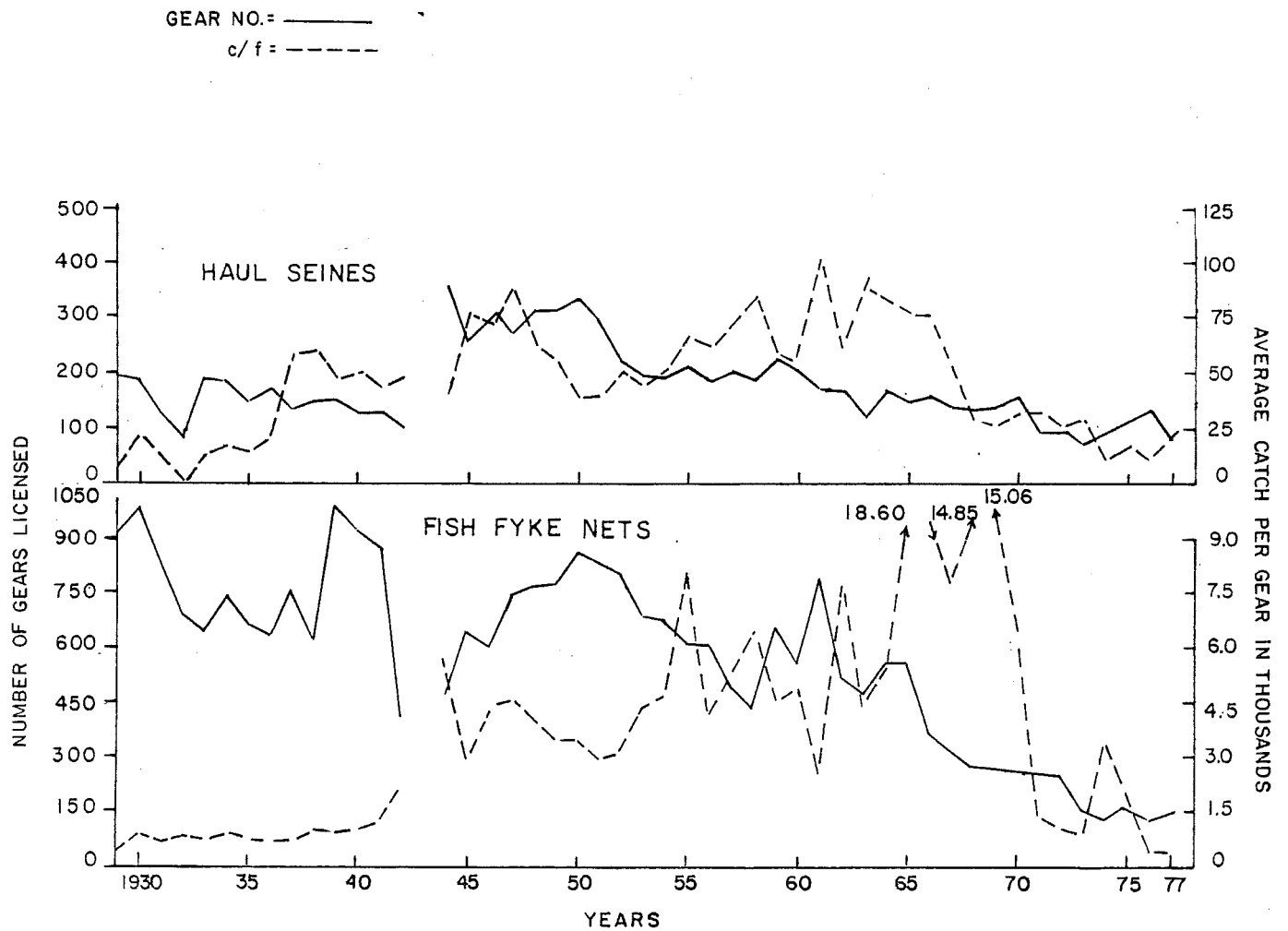


Figure 7. Operating units and average catch per gear for Haul Seines and Fish Fyke Nets.

Table 12. Haul seines commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

Year	Number of gear units	Total pounds landed	Average catch per haul seines	Total value of catch	Average value per haul seines
1929	196	1,372	7.00	83	.42
30	187	4,151	22.20	213	1.14
31	131	1,610	12.29	78	.60
32	91	126	1.39	3	.03
33	191	2,360	12.36	75	.39
34	183	3,241	17.71	86	.47
35	152	2,348	15.45	67	.44
36	176	3,706	21.06	62	.35
37	139	8,231	59.22	155	1.12
38	148	8,936	60.38	196	1.32
39	155	7,493	48.34	144	.93
40	135	6,662	49.35	137	1.02
41	130	5,840	44.92	152	1.17
42	113	5,381	47.62	150	1.33
44 ⁽¹⁾	362	13,878	38.34	648	1.79
45	259	19,925	76.93	1,963	7.58
46	300	22,377	74.59	1,853	6.18
47	270	24,506	90.76	1,964	7.27
48	318	21,027	66.12	1,888	5.94
49	318	18,176	57.16	1,577	4.96
50	335	12,856	38.38	1,195	3.57
51	287	11,477	39.99	864	3.01
52	221	11,004	49.79	749	3.39
53	193	8,817	45.68	636	3.30
54	190	9,925	52.24	750	3.95
55	214	14,078	65.79	921	4.30
56	184	11,741	63.81	681	3.70
57	201	14,401	71.65	1,034	5.14
58	185	15,720	84.97	992	5.36
59	226	13,063	57.80	1,031	4.56
60	209	11,505	55.05	755	3.61
61	177	18,565	104.89	758	4.28
62	170	9,704	57.08	589	3.47
63	140	12,550	89.64	537	3.84
64	171	7,288	42.62	580	3.39
65	155	11,992	77.37	449	2.90
66	160	12,215	76.34	533	3.33
67	142	7,790	54.86	405	2.85
68	132	4,033	30.55	258	1.96
69	137	3,760	27.45	236	1.72
70	158	5,293	33.50	386	2.44
71	92	3,144	34.17	314	3.41
72	93	2,301	24.74	283	3.04
73	68	1,997	29.37	273	4.02
74	95	988	10.40	158	1.66
75	112	1,819	16.24	231	2.06
76	136	1,584	11.65	218	1.60
77	83	1,996	24.05	258	3.11
Average	180	8,812	45.69	574	2.86

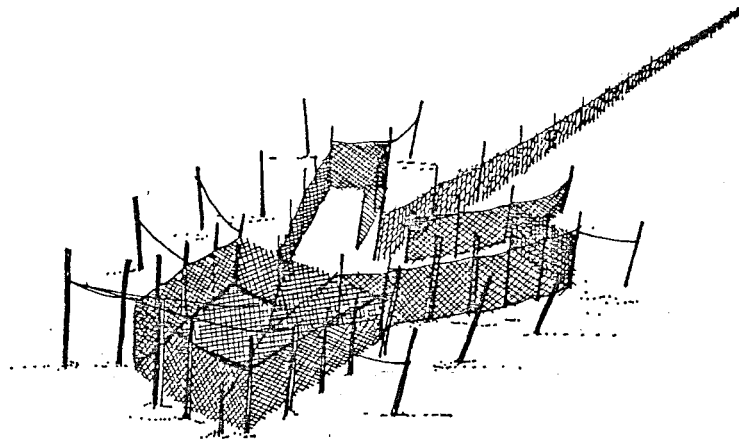
(1) 1943 data not available.

Table 13. Fish fyke net commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

Year	Number of gear units	Total pounds landed	Average catch per net	Total value of catch	Average value per net
1929	926	508	.55	34	.04
30	1,084	979	.90	51	.05
31	832	594	.71	28	.03
32	690	607	.88	24	.04
33	649	538	.83	20	.03
34	740	684	.92	29	.04
35	667	540	.81	21	.03
36	635	464	.73	19	.03
37	762	559	.73	19	.03
38	621	717	1.16	28	.05
39	1,084	1,033	.95	41	.04
40	922	1,035	1.12	50	.05
41	875	1,095	1.25	85	.10
42	407	904	2.22	53	.13
44(1)	473	2,612	5.52	208	.44
45	648	1,920	2.96	147	.23
46	605	2,603	4.30	310	.51
47	743	3,371	4.54	465	.63
48	758	3,070	4.05	357	.47
49	776	2,693	3.47	262	.34
50	858	3,037	3.54	278	.32
51	833	2,448	2.94	264	.32
52	800	2,557	3.20	213	.27
53	685	2,979	4.35	270	.39
54	675	3,169	4.70	264	.39
55	614	4,904	7.99	310	.51
56	606	2,526	4.17	127	.21
57	491	2,484	5.06	148	.30
58	431	2,766	6.42	169	.39
59	656	3,004	4.58	175	.27
60	546	2,692	4.93	144	.26
61	796	1,995	2.51	106	.13
62	515	3,867	7.51	165	.32
63	479	2,130	4.45	77	.16
64	562	3,109	5.53	122	.22
65	561	10,432	18.60	220	.39
66	361	3,435	9.52	140	.39
67	324	2,501	7.72	113	.35
68	271	4,023	14.85	130	.48
69	271	4,080	15.06	164	.61
70	270	1,739	6.44	121	.45
71	264	379	1.44	49	.19
72	265	298	1.13	38	.14
73	158	143	.91	42	.27
74	138	483	3.50	85	.62
75	160	337	2.11	90	.56
76	135	47	.35	10	.07
77	153	54	.35	10	.07
Average	579	2,045	4.01	131	.26

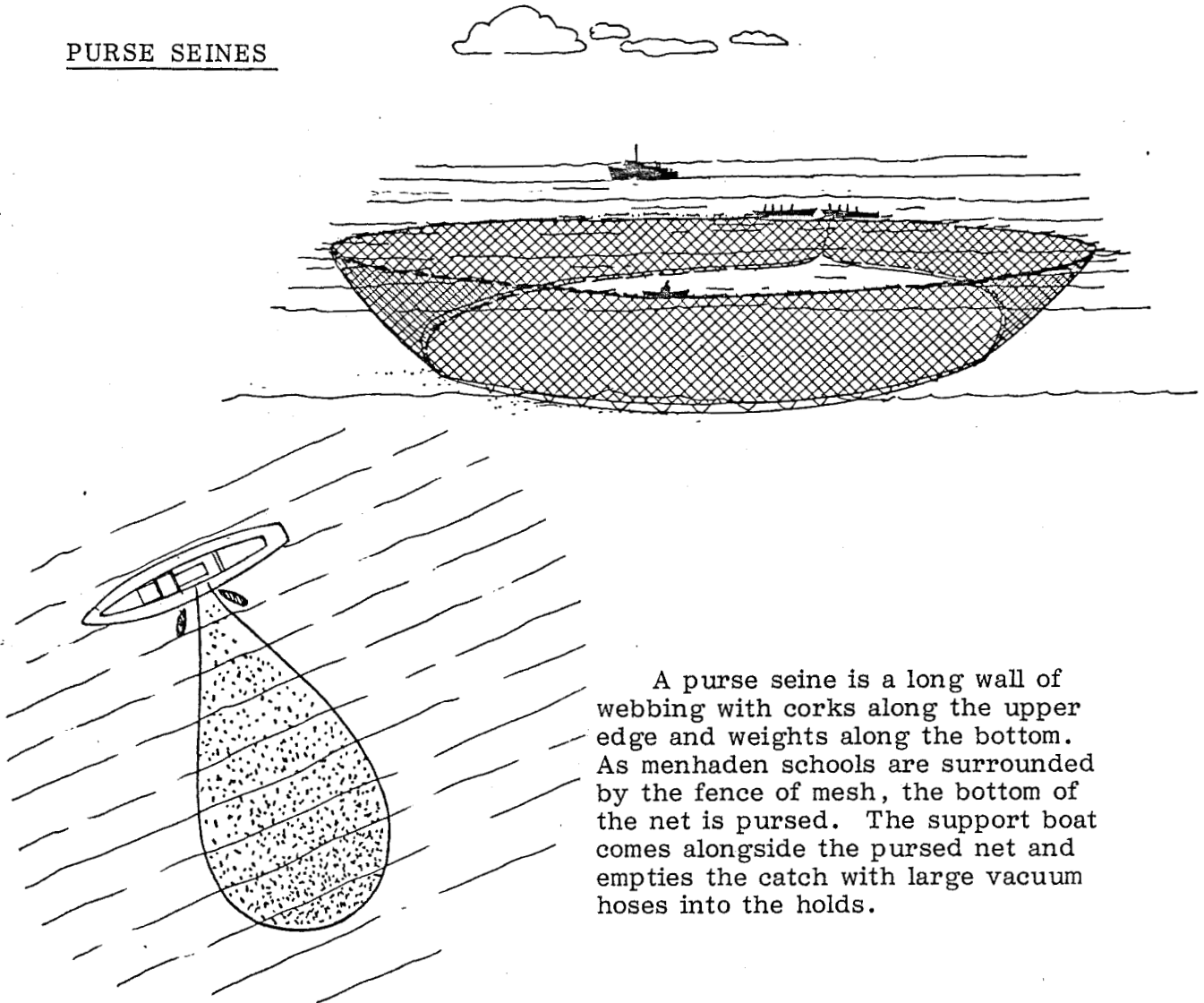
(1) 1943 data not available.

FISH POUND NETS



Fish pound nets are one of the most effective gears ever developed. They are set in water 15-40 ft. deep, with the leader running into shallower water. Fish moving perpendicular to the lead and parallel to the shore, turn when they approach the lead and follow it to deeper water. There the funnels and heart of the net wait, and the fish swim in. The heart is lifted by hand. Pound nets require considerable investment of materials, boats, manpower, and require special designated sites.

Pound nets have been one of Virginia's most productive gear. The long term average total catch per year was 60 million pounds, while each gear captured an average of 60 thousand pounds. The average yearly return per net was 1.8 thousand dollars (Table 14). Pound nets declined in number 1930-55 as the average c/f rose and fell with the stock sizes of the various species captured. After the late sixties and through the seventies, the number declined to the lowest levels (Fig. 8), just at the time the croaker and grey trout were making a big comeback in Virginia. Average c/f rose steadily and some nets were lifted twice daily, with catches of 10-20 thousand pounds per lift common. The pound netters that were left by the mid-seventies had the opportunity to capitalize as a fishery growing in strength and complexity. Most of the pound netters in the upper rivers were not a part of this bonanza because they were the first to drop out after the alewife and striped bass decline of the sixties.

PURSE SEINES

A purse seine is a long wall of webbing with corks along the upper edge and weights along the bottom. As menhaden schools are surrounded by the fence of mesh, the bottom of the net is pursed. The support boat comes alongside the pursed net and empties the catch with large vacuum hoses into the holds.

Purse seine catches (of menhaden) have averaged 218 million pounds for the 27 units (average) operating 1929-77. The total number of units has been very uniform over the period (Fig. 8), with a minor depression 1941-55. The greatest number of seines (4) were operating in the mid-sixties. As the number of nets increased from 1955-65, the average c/f declined. When net numbers fell off toward the seventies, the average catch increased to all time highs (Table 15). The average purse seine landed 8.4 million pounds per year.

Purse seines and their handling have been improved in efficiency over the years. Hydraulic blocks and vacuum catch retrieval has allowed faster turn-around time between sets at sea. Vessel power and holding capacity has increased, allowing more fishing hours per month. The most important aid to purse seining has been the use of spotter planes to locate the menhaden schools. The information is radioed to the ship(s) and the nearest or several converge on the school(s). This increased ability to find fish, has been more important to increasing catches than any of the mechanical refinements. The menhaden fishery in Virginia has not fished itself out through 1977, and the long term record indicates it had little if anything to do with controlling its own future success.

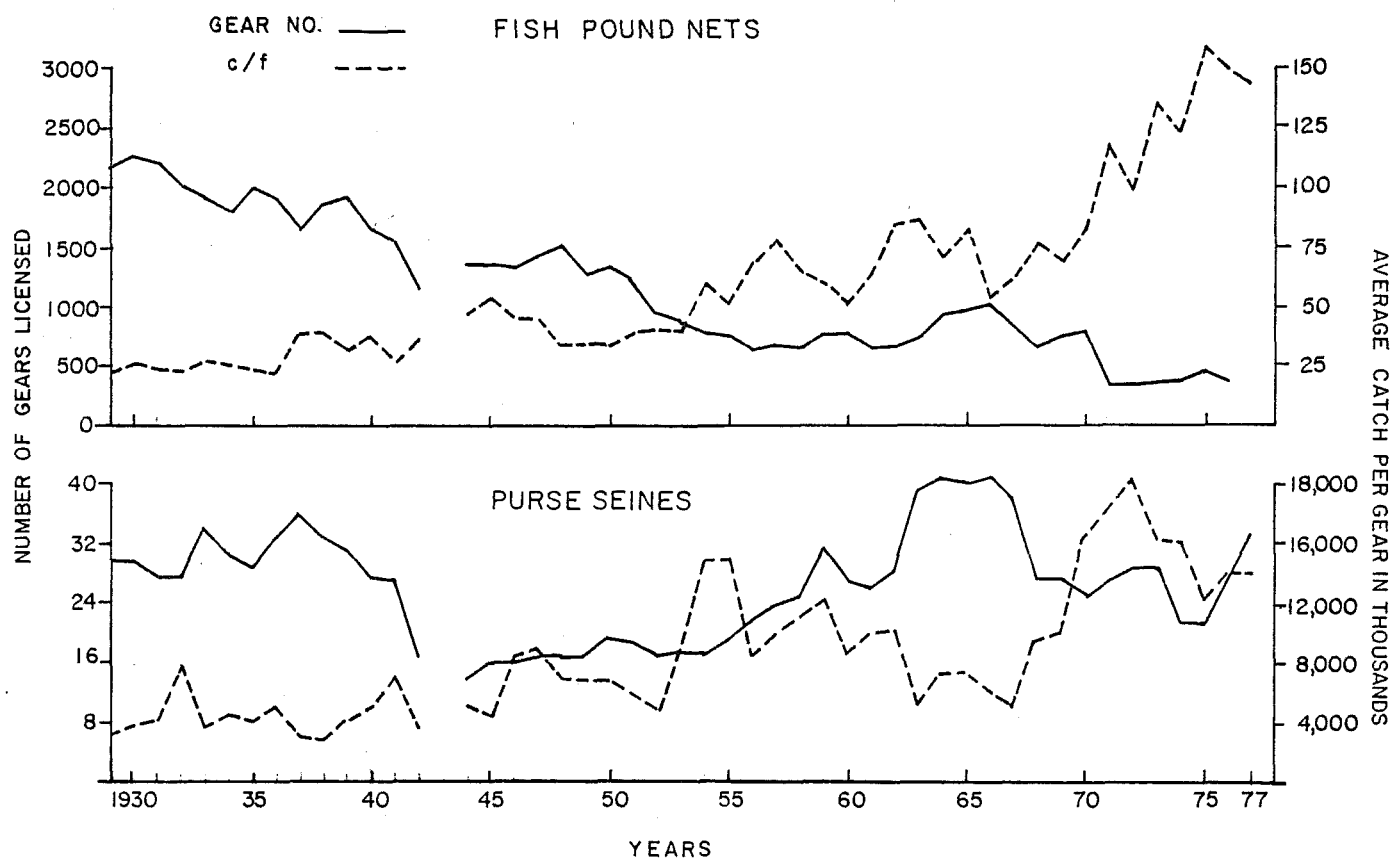


Figure 8. Operating units and average catch per year per gear for fish pound nets and purse seines in the Virginia fishery.

Table 14. Fish pound net commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

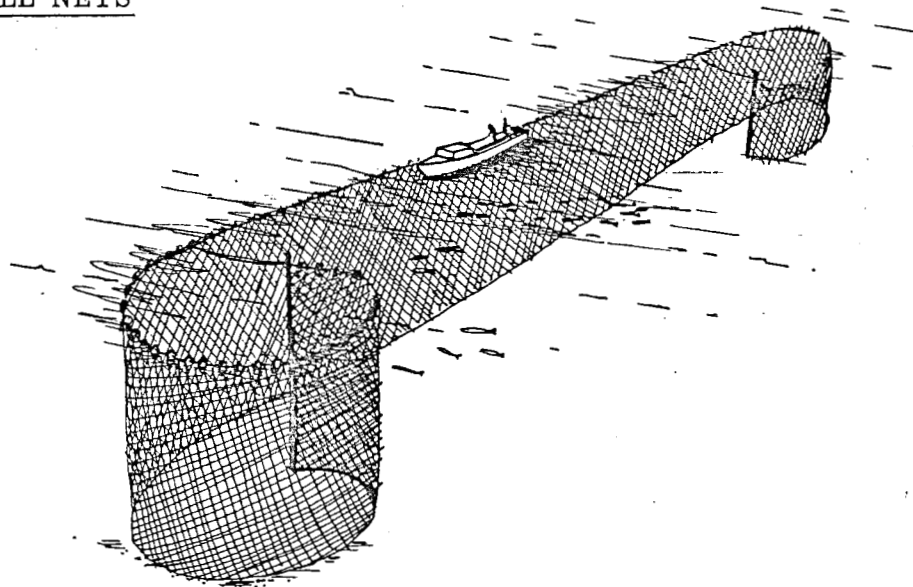
Year	Number of gear units	Total pounds landed	Average catch per net	Total value of catch	Average value per net
1929	2,190	48,799	22.28	2,401	1.10
30	2,262	58,498	25.86	2,134	.94
31	2,208	53,839	24.38	1,666	.75
32	2,019	48,836	24.19	1,102	.55
33	1,880	51,365	27.32	990	.53
34	1,810	46,058	25.45	960	.53
35	2,000	48,739	24.37	771	.39
36	1,902	46,240	24.31	654	.34
37	1,656	63,235	38.19	1,107	.67
38	1,871	73,745	39.42	1,256	.67
39	1,932	65,159	33.73	1,199	.62
40	1,626	61,824	38.02	1,062	.65
41	1,515	42,194	27.85	910	.60
42	1,146	40,140	35.03	904	.79
44 ⁽¹⁾	1,363	62,081	45.55	2,571	1.89
45	1,332	78,736	59.11	6,324	4.75
46	1,311	59,544	45.42	3,866	2.95
47	1,401	63,022	44.98	3,601	2.57
48	1,490	50,834	34.12	2,638	1.77
49	1,283	44,786	34.64	2,082	1.61
50	1,323	45,490	34.38	1,803	1.36
51	1,208	45,490	37.66	1,435	1.19
52	936	38,253	40.87	1,214	1.30
53	858	33,551	39.10	1,197	1.40
54	782	44,597	57.03	1,489	1.90
55	720	37,395	51.94	1,239	1.72
56	604	41,521	68.74	1,354	2.24
57	685	54,024	78.87	1,621	2.37
58	664	45,012	67.79	1,245	1.88
59	753	45,207	60.04	1,528	2.03
60	778	40,004	51.42	1,276	1.64
61	643	41,771	64.96	1,410	2.19
62	666	56,399	84.68	1,624	2.44
63	711	61,364	86.31	1,494	2.10
64	921	64,721	70.27	1,726	1.87
65	966	79,993	82.81	1,997	2.07
66	1,000	53,227	53.23	1,497	1.50
67	836	51,108	61.13	1,423	1.70
68	640	48,007	75.01	1,088	1.70
69	714	48,487	67.91	1,385	1.94
70	795	66,970	84.24	1,923	2.42
71	334	38,428	115.05	1,076	3.22
72	325	31,886	98.11	1,366	4.20
73	346	46,540	134.51	2,405	6.95
74	386	47,549	123.18	2,299	5.96
75	408	63,862	156.53	2,507	6.14
76	374	55,360	148.02	2,566	6.86
77	429	61,001	142.19	2,835	6.61
Average	1,125	51,977	60.63	1,755	2.16

(1) 1943 data not available.

Table 15. Purse seines commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

Year	Number of gear units	Total pounds landed	Average catch per purse seines	Total value of catch	Average value per purse seines
1929	31	98,226	3,168.58	817	26.36
30	31	114,954	3,708.19	762	24.58
31	27	111,382	4,125.26	363	13.44
32	26	193,921	7,458.50	649	24.96
33	34	115,343	3,392.44	384	11.29
34	32	143,010	4,469.06	596	18.63
35	29	119,231	4,111.41	408	14.07
36	33	165,853	5,025.85	912	27.64
37	36	119,763	3,326.75	479	13.31
38	33	93,612	2,836.73	359	10.88
39	31	126,648	4,085.42	544	17.55
40	27	135,965	5,035.74	530	19.63
41	26	180,148	6,928.77	944	36.31
42	17	61,370	3,610.00	436	25.65
44 ⁽¹⁾	14	72,188	5,156.29	426	30.43
45	16	73,564	4,597.75	519	32.44
46	16	139,232	8,702.00	1,392	87.00
47	18	169,854	9,436.33	1,607	89.28
48	18	140,326	7,795.89	1,489	82.72
49	18	126,430	7,023.89	1,467	81.50
50	21	160,776	7,656.00	1,415	67.38
51	20	118,134	5,906.70	1,063	53.15
52	18	85,794	4,766.33	1,072	59.56
53	19	155,444	8,181.26	1,617	85.11
54	18	274,945	15,274.72	3,519	195.50
55	20	305,691	15,284.55	3,638	181.90
56	22	180,393	8,199.68	2,345	106.59
57	24	240,439	10,018.29	2,885	120.21
58	26	303,260	11,663.85	4,095	157.50
59	31	389,200	12,554.84	4,009	129.32
60	27	223,595	8,281.30	1,887	69.89
61	26	259,943	9,997.81	2,547	97.96
62	29	290,341	10,011.76	3,339	115.14
63	39	217,153	5,568.03	2,780	71.28
64	41	296,995	7,243.78	4,247	103.59
65	40	310,197	7,754.93	4,653	116.33
66	41	249,371	6,082.22	3,940	96.10
67	38	201,734	5,308.79	2,670	70.26
68	27	255,781	9,473.37	3,427	126.93
69	27	161,719	5,989.59	2,345	86.85
70	25	405,960	16,238.40	6,739	269.56
71	27	375,683	13,914.19	6,207	229.89
72	29	538,997	18,586.10	9,006	310.55
73	29	479,121	16,521.41	20,012	690.07
74	22	358,177	16,280.77	10,745	488.41
75	22	279,186	12,690.27	6,980	317.27
76	28	408,092	14,574.71	12,243	437.25
77	33	461,982	13,997.94	18,939	573.91
Average	27	218,522	8,375.34	3,405	127.40

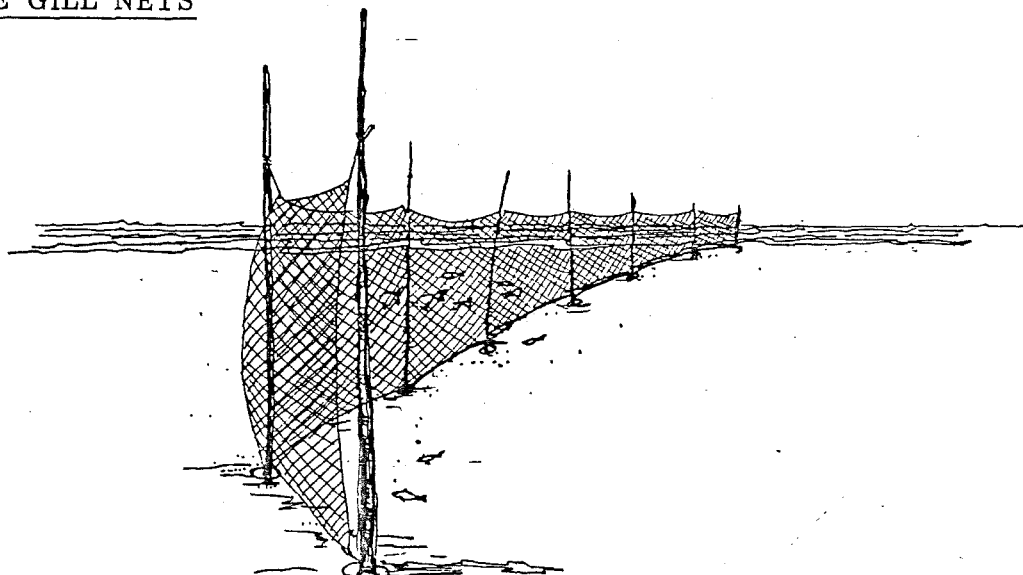
(1) 1943 data not available.

DRIFT GILL NETS

Drift gill nets are usually quite deep (10-15 ft) and are set to float on the surface and drift with the current. They are used primarily in open water to capture species that inhabit the upper water column, such as shad.

Drift gill nets averaged 1.9 thousand pounds per gear worth an average of 370 dollars from 1929-77 (Table 16). The major species has been shad, but striped bass have often been a significant component. The number of nets remained fairly stable from 1945-70, dropped to 216 in 1973, then rebounded to all time highs of 2-4 thousand through the mid-seventies (Fig. 5). The average catch per net per year has followed the general strength of the shad and bass stocks, until the extreme conditions of the seventies. The sudden increase in gear in the mid-seventies was related to a depressed economy, as greater numbers of unemployed "returned to the water" with the affordable gear. The average catch stayed low 1974-77.

STAKE GILL NETS



When gill nets are suspended from a row of vertical poles they are called stake gill nets. The row of poles is placed perpendicular to the tidal flow along channel banks or other shoal areas. Anchors and buoys are not used with this gear. American shad and striped bass are the primary species captured.

The 1929-45 stake gill net fishery was the highest on record, then plunged to 497 units by 1947. After that the fishery increased steadily until 1967 as the c/f fell off correspondingly (Fig. 9). When the number of nets decreased through the early seventies, the average catch per net rose to record highs. The fishery responded by gearing up again and through 1977 catches were good. The average c/f per net for 1929-77 was 1.38 thousand pounds worth an average of 200 dollars per net (Table 17).

Stake gill nets are a major gear in the tidal rivers. Since they are a fixed gear, there is a tendency to license them without firm anticipation of use in the spring (to hold the fishing site). When shad are abundant, stake gill nets are the primary gear of capture.

The data for anchor gill nets are presented in Table 18. The gear numbers after 1960 are unreliable because NMFS combined anchor gill net licenses with stake gill net licenses, and reported the catch as a combined catch.

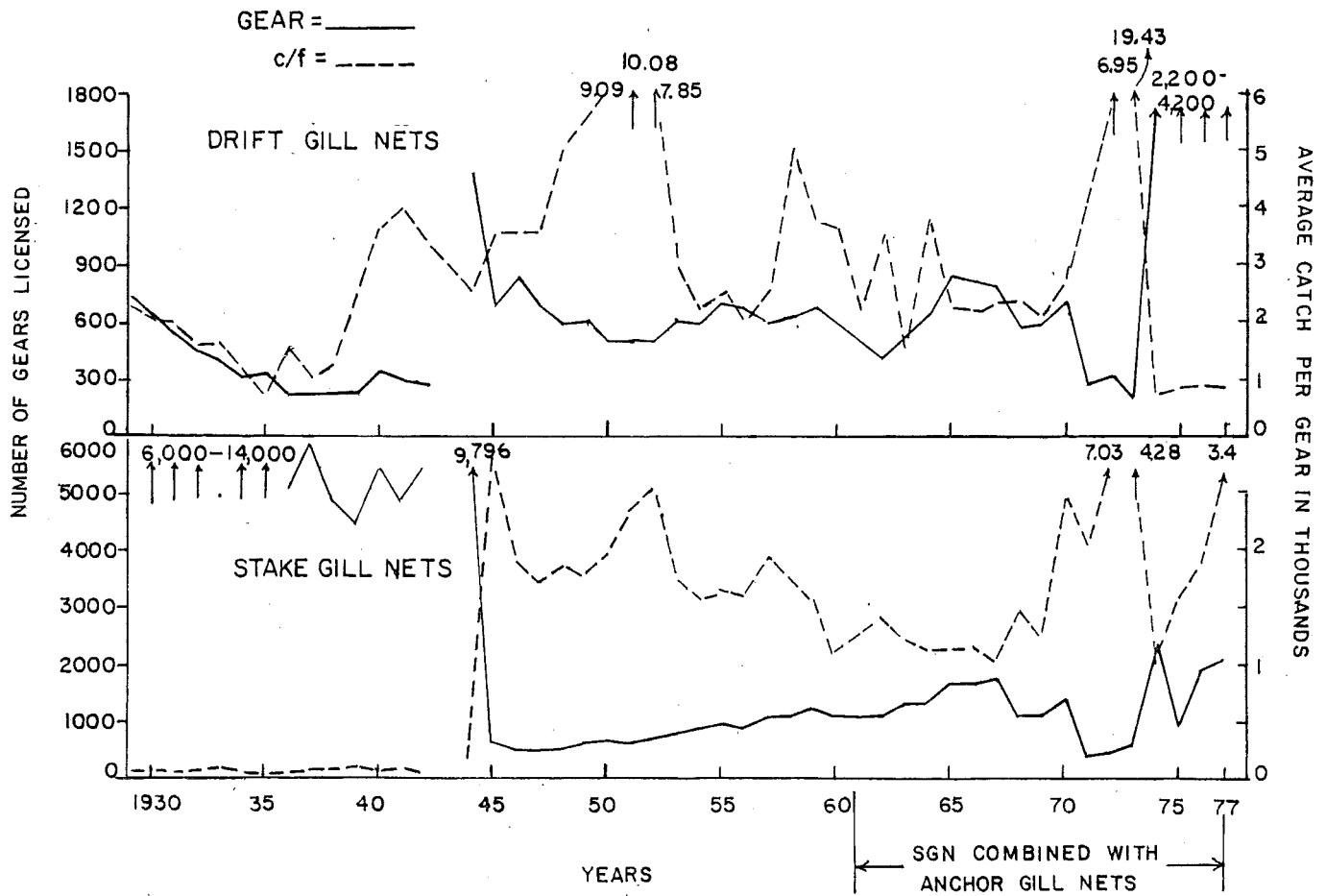


Figure 9. Operating units and average catch per gear for Drift Gill Nets and Stake Gill Nets.

Table 16. Drift gill net commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

Year	Number of gear units	Total pounds landed	Average catch per net	Total value of catch	Average value per net
1929	756	1,767	2.34	152	.20
30	652	1,399	2.15	144	.22
31	540	1,077	1.99	91	.17
32	457	734	1.61	52	.11
33	410	657	1.60	46	.11
34	312	369	1.18	25	.08
35	332	232	.70	20	.06
36	203	312	1.54	21	.10
37	223	220	.99	17	.08
38	234	291	1.24	22	.09
39	234	587	2.51	31	.13
40	346	1,255	3.63	44	.13
41	298	1,192	4.00	50	.17
42	230	781	3.40	45	.20
44 ⁽¹⁾	1,378	3,423	2.48	274	.20
45	706	2,510	3.56	307	.44
46	762	2,878	3.78	314	.41
47	715	2,688	3.76	247	.35
48	596	2,954	4.96	287	.48
49	617	3,454	5.60	360	.58
50	526	4,780	9.09	594	1.13
51	526	5,303	10.08	601	1.14
52	526	4,127	7.85	402	.76
53	616	1,869	3.03	233	.38
54	596	1,365	2.29	163	.27
55	684	1,728	2.53	186	.27
56	668	1,372	2.05	148	.22
57	596	1,534	2.57	204	.34
58	630	3,139	4.98	296	.47
59	685	2,651	3.87	232	.34
60	594	2,133	3.59	217	.37
61	530	1,213	2.29	117	.22
62	403	1,431	3.55	145	.36
63	552	917	1.66	103	.19
64	639	2,472	3.87	190	.30
65	847	1,903	2.25	174	.21
66	823	1,800	2.19	166	.20
67	739	1,658	2.24	159	.22
68	560	1,290	2.30	97	.17
69	563	1,199	2.13	139	.25
70	714	1,919	2.69	184	.26
71	273	1,583	5.80	172	.63
72	306	2,128	6.95	298	.97
73	216	4,196	19.43	659	3.05
74	3,026	2,332	.77	444	.15
75	4,298	3,471	.81	690	.16
76	2,253	1,985	.88	340	.15
77	2,978	2,504	.84	496	.17
Average	758	1,933	3.45	217	.37

(1) 1943 data not available.

Table 17. Stake gill net commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

<u>Year</u>	<u>Number of gear units</u>	<u>Total pounds landed</u>	<u>Average catch per net</u>	<u>Total value of catch</u>	<u>Average value per net</u>
1929	14,526	653	.05	125	.01
30	16,453	821	.05	124	.01
31	14,021	623	.04	78	.01
32	7,822	622	.08	47	.01
33	4,913	494	.10	38	.01
34	6,802	365	.05	35	.01
35	7,380	312	.04	31	.004
36	5,100	300	.06	23	.01
37	5,963	398	.07	32	.01
38	4,863	333	.07	32	.01
39	4,531	450	.10	39	.01
40	5,428	362	.07	38	.01
41	4,891	436	.09	43	.01
42	5,475	344	.06	32	.01
44(1)	9,796	1,266	.13	141	.01
45	620	1,738	2.80	289	.47
46	531	1,020	1.92	156	.29
47	497	869	1.75	155	.31
48	517	956	1.85	132	.26
49	612	1,101	1.80	120	.20
50	630	1,249	1.98	169	.27
51	627	1,476	2.35	208	.33
52	728	1,875	2.58	244	.34
53	809	1,441	1.78	198	.25
54	941	1,501	1.60	218	.23
55	999	1,643	1.65	258	.26
56	967	1,540	1.59	200	.21
57	1,034	1,981	1.92	289	.28
58	1,053	1,818	1.73	283	.27
59	1,245	1,954	1.57	287	.23
60	1,118	1,243	1.11	164	.15
61	1,122	1,394	1.24	215	.19
62	1,170	1,664	1.42	196	.17
63	1,279	1,552	1.21	206	.16
64	1,353	1,557	1.15	209	.15
65	1,662	1,921	1.16	265	.16
66	1,541	1,798	1.17	243	.16
67	1,598	1,712	1.07	185	.12
68	1,164	1,724	1.48	181	.16
69	1,175	1,457	1.24	159	.14
70	1,410	3,455	2.45	359	.26
71	413	884	2.14	127	.31
72	417	2,932	7.03	339	.81
73	608	2,601	4.28	342	.56
74	2,311	2,481	1.07	427	.19
75	977	1,651	1.69	559	.57
76	1,911	3,593	1.88	824	.43
77	2,087	7,170	3.44	1,075	.52
Average	3,189	1,474	1.38	211	.20

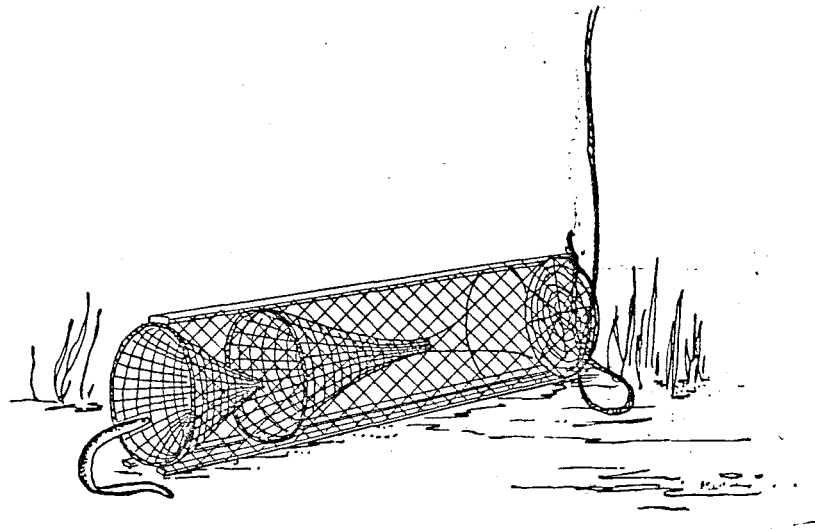
(1) 1943 data not available.

Table 18. Anchor gill net commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

Year	Number of gear units	Total pounds landed	Average catch per net	Total value of catch	Average value per net
1929	-(1)	-	-	-	-
30	1	18	18.00	1	1.00
31	-	-	-	-	-
32	-	-	-	-	-
33	-	-	-	-	-
34	-	-	-	-	-
35	-	-	-	-	-
36	2	30	15.00	1	.50
37	3	84	28.00	2	.67
38	-	-	-	-	-
39	-	-	-	-	-
40	-	-	-	-	-
41	-	-	-	-	-
42	-	-	-	-	-
44(2)	-	-	-	-	-
45	86	1,262	14.67	137	1.59
46	105	987	9.40	83	.79
47	174	342	1.97	25	.14
48	124	260	2.10	24	.19
49	56	180	3.21	10	.18
50	49	115	2.35	12	.25
51	11	23	2.09	2	.18
52	13	52	4.00	4	.31
53	5	22	4.40	1	.20
54	51	177	3.47	16	.31
55	65	278	4.28	21	.32
56	35	177	5.06	15	.43
57	91	368	4.04	38	.42
58	110	306	2.78	25	.23
59	183	371	2.03	46	.25
60	165	500	3.03	75	.46
61	1,122	1,394	1.24	215	.19
62	1,170	1,664	1.42	196	.17
63	1,279	1,552	1.21	206	.16
64	1,353	1,557	1.15	209	.15
65	1,662	1,921	1.16	265	.16
66	1,541	1,798	1.17	243	.16
67	1,598	1,712	1.07	185	.12
68	1,164	1,724	1.48	181	.16
69	1,175	1,457	1.24	159	.14
70	1,410	3,455	2.45	359	.26
71	413	884	2.14	127	.31
72	417	2,932	7.03	339	.81
73	608	2,601	4.28	342	.56
74	2,311	2,481	1.07	427	.19
75	977	1,651	1.69	559	.57
76	1,911	3,593	1.88	824	.43
77	2,087	7,170	3.44	1,075	.52
Average	654	1,253	4.58	179	.37

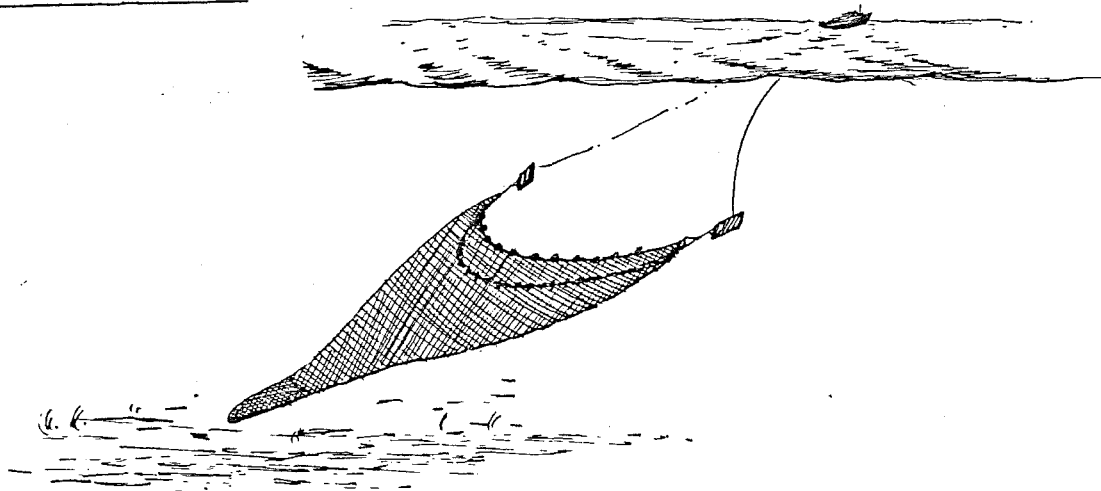
(1) Anchor gill nets not used during 1929, 1931-35, and 1938-44.

(2) 1943 data not available.

EEL POTS

Eel pots are very similar to fish pots except the mesh is much smaller. They are set on the bottom in the rivers (primarily) and left baited overnight. Eels enter the funnel and are trapped in the main chamber.

The eel pot fishery stayed at low levels until 1945, then expanded rapidly to 1950, fell off and held steady until 1965, and expanded again to record levels as eels became more in demand and prices rose (Fig.10). The yearly c/f's have reflected the changing stock size of the eel populations. As with several other gears discussed, increased fishing pressure lowered c/f and decreased operating units gave good returns to the remainder. Each eel pot yielded an average of 30 dollars over the 1929-77 period. When catches were good, a single pot could earn 100-180 dollars per season, such as in 1974-75. The average number of eel pots was 2,333 per year (Table 19).

OTTER TRAWLS

Although otter trawls are only used outside Chesapeake Bay, they are shown here for completeness. The gear is towed along the bottom behind large vessels with substantial deck machinery. Trawls are a very efficient gear, used mainly for flounder, scup, sea bass, and several other species available in the Atlantic. They are not used in the river fisheries.

The trawl fishery was active 1929-42 with moderate c/f's that kept increasing. After the War the trawlers returned to the Atlantic and catches broke all previous records. This caused a rapid increase in the units operating, and as the fishery expanded the average catch per trawl continued to fall (Fig. 10). The trawler fleet depended primarily on flounder, croaker; and sea bass, all "near shore" species. The foreign trawlers concentrated on the industrial fish 12 or more miles off shore, such as alewife, mackerel, some flounder, and the squids.

The Virginia trawler fleet averaged 51 vessels landing an average 12.9 million pounds per year with an average catch per gear of 308 thousand pounds (Table 20). Since 1967, the average gear c/f has stayed below 130 thousand pounds per year. The fishery appears to have overexploited its basic resource and c/f probably will take years to recover, if it ever does considering the amount of gear presently in operation.

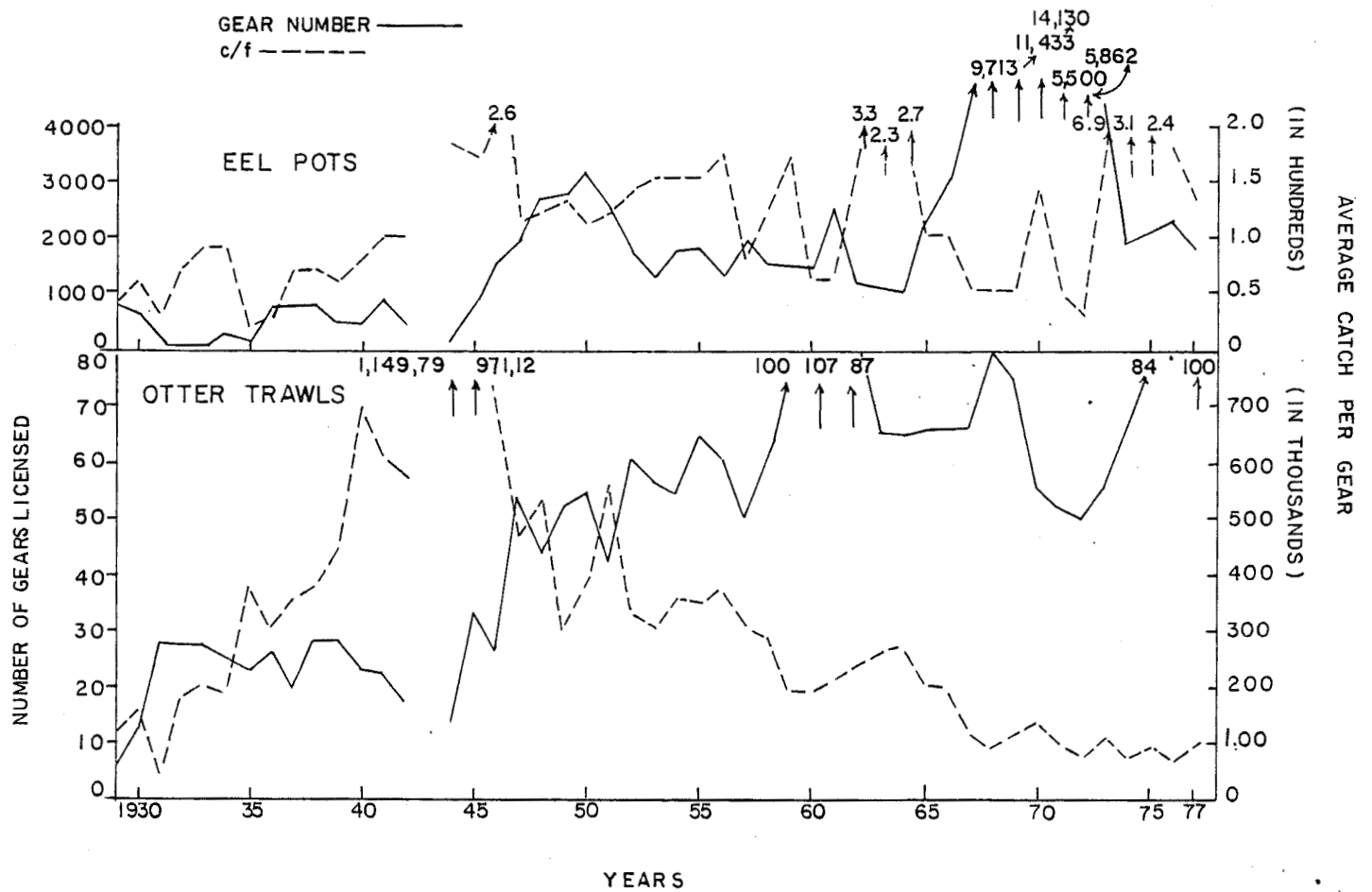


Figure 10. Operating units and average catch per gear for Eel Pots and Otter Trawls.

Table 19. Eel pot commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

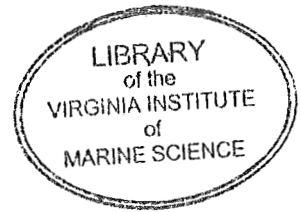
Year	Number of gear units	Total pounds landed	Average catch per pot	Total value of catch	Average value per pot
1929	160	6	.04	1	.01
30	640	40	.06	3	.01
31	30	1	.03	1	.03
32	14	1	.07	1	.07
33	35	3	.09	1	.03
34	335	29	.09	2	.01
35	164	4	.02	1	.01
36	780	24	.03	2	.003
37	677	44	.07	2	.003
38	734	49	.07	5	.01
39	585	36	.06	2	.003
40	571	45	.08	3	.01
41	812	83	.10	7	.01
42	445	44	.10	5	.01
44(1)	204	37	.18	1	.01
45	775	128	.17	15	.02
46	1,525	393	.26	47	.03
47	1,980	216	.11	24	.01
48	2,647	318	.12	38	.01
49	2,786	373	.13	34	.01
50	3,157	361	.11	49	.02
51	2,594	299	.12	30	.01
52	1,713	244	.14	20	.01
53	1,352	198	.15	17	.01
54	1,744	260	.15	14	.01
55	1,774	267	.15	30	.02
56	1,268	209	.17	22	.02
57	1,837	146	.08	17	.01
58	1,578	186	.12	22	.01
59	1,529	252	.17	26	.02
60	1,463	81	.06	9	.01
61	2,482	141	.06	22	.01
62	1,104	128	.12	21	.02
63	1,013	330	.33	43	.04
64	912	212	.23	11	.01
65	2,096	560	.27	124	.06
66	2,875	293	.10	63	.02
67	4,703	488	.10	79	.02
68	9,713	439	.05	86	.01
69	11,433	537	.05	93	.01
70	14,130	650	.05	128	.01
71	5,500	743	.14	203	.04
72	5,862	317	.05	79	.01
73	4,250	136	.03	41	.01
74	1,922	1,322	.69	346	.18
75	3,976	1,231	.31	398	.10
76	2,230	524	.24	180	.08
77	1,870	329	.18	96	.05
Average	2,333	266	.13	51	.03

(1) 1943 data not available.

Table 20. Otter trawl commercial catch, value and yearly averages for Virginia, in thousands of pounds and dollars. Totals include all species captured.

Year	Number of gear units	Total pounds landed	Average catch per trawl	Total value of catch	Average value per trawl
1929	5	599	119.80	31	6.20
30	12	1,883	156.92	86	7.17
31	27	1,231	45.59	49	1.82
32	27	5,047	186.93	142	5.26
33	27	5,441	201.52	129	4.78
34	25	4,555	182.20	113	4.52
35	23	8,653	376.22	173	7.52
36	26	7,930	305.00	189	7.27
37	19	6,207	326.68	146	7.68
38	28	10,658	380.64	228	8.14
39	28	12,622	450.79	273	9.75
40	23	15,955	693.70	350	15.22
41	22	13,320	605.46	383	17.41
42	17	9,770	574.71	408	24.00
44(1)	14	16,097	1,149.79	1,297	92.64
45	33	32,047	971.12	2,993	90.70
46	26	20,627	793.35	1,755	67.50
47	54	24,889	460.91	2,057	38.09
48	44	22,287	506.52	1,932	43.91
49	52	15,411	296.37	1,437	27.64
50	54	18,302	338.93	1,985	36.76
51	42	23,080	549.52	2,396	57.05
52	60	20,197	336.62	2,013	33.55
53	56	17,787	317.63	1,711	30.55
54	54	19,027	352.35	1,666	30.85
55	64	22,240	347.50	1,556	24.31
56	60	22,750	379.17	1,720	28.67
57	49	14,957	305.25	1,420	28.98
58	60	17,078	284.63	1,458	24.30
59	100	19,890	198.90	1,925	19.25
60	107	21,088	197.08	1,773	16.57
61	87	18,016	207.08	1,630	18.74
62	79	18,416	233.11	1,827	23.13
63	65	16,256	250.09	1,505	23.15
64	63	16,591	263.35	1,218	19.33
65	66	13,316	201.76	1,153	17.47
66	67	13,184	196.78	1,494	22.30
67	69	8,736	126.61	1,045	15.15
68	80	7,014	87.68	1,076	13.45
69	74	8,308	112.27	1,382	18.68
70	57	7,385	129.56	1,430	25.09
71	52	5,054	97.19	917	17.64
72	49	4,251	86.76	926	18.90
73	55	5,802	105.49	1,291	23.47
74	66	5,130	77.73	1,106	16.76
75	84	7,053	83.96	1,446	17.21
76	79	5,473	69.28	1,457	18.44
77	100	7,813	78.13	2,587	25.87
Average	51	12,905	308.31	1,193	24.02

(1) 1943 data not available.

HARD CLAMS

Patent tongs and clam rakes plotted against gear number were shown in Figure 2. Here examine the relationship with total landings while putting both gears to the same scale.

From 1929-58 both gears fluctuated together, while landings followed the general rise and fall of the c/f's (Fig. 11). After 1958, patent tongs became the dominant gear as the rake catch showed a declining fishery (Table 21). By 1965 the rake c/f was rising and paralleled the increasing c/f's shown by patent tongs. Landings however, did not rise but declined for the next 10 years.

After the War, clam landings and c/f fell to record lows as the gear units continued to increase (Fig. 2). Since c/f stayed low until 1960, the low landings were due to reduced clam density. Through the fifties the resource was apparently overfished. Clams, unlike oysters, are not a managed fishery, thus their return to abundance in the sixties was a natural event. The reduced gear usage after 1967 allowed the population to rebuild.

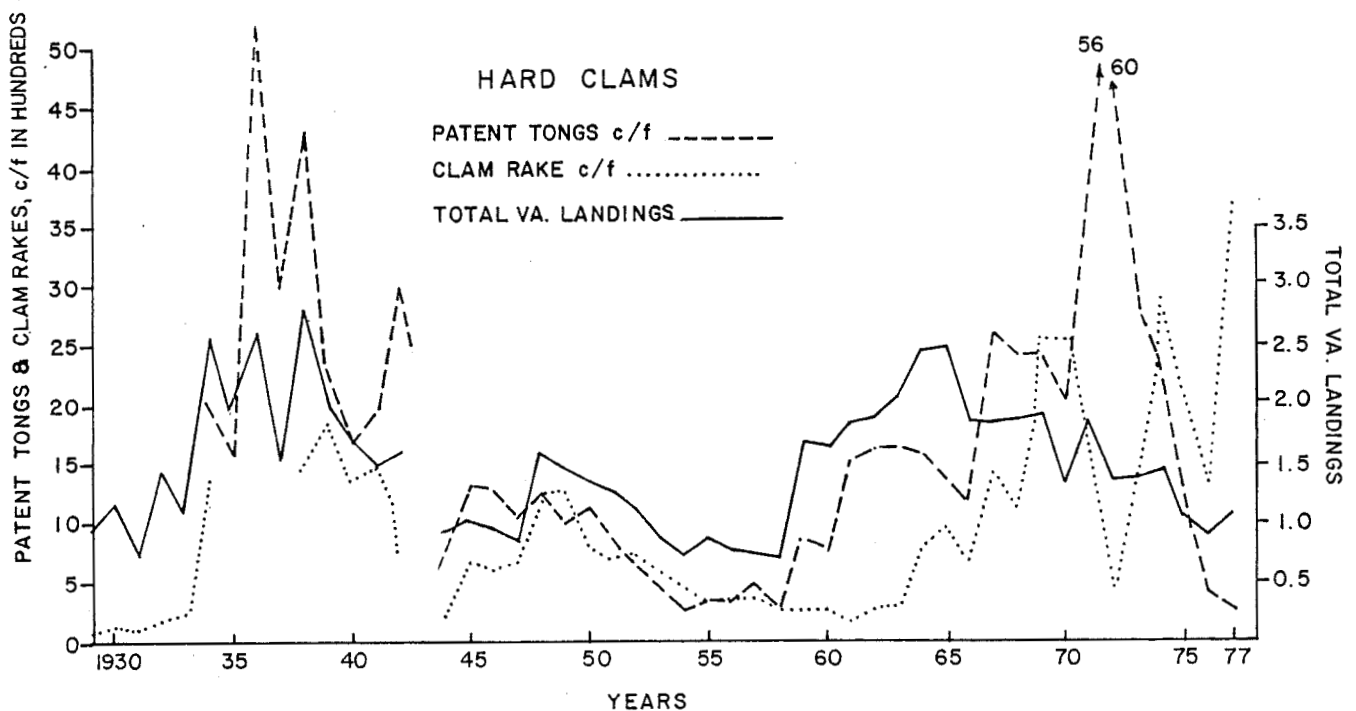


Figure 11. Hard Clam landings, patent tong c/f, and clam rake c/f.

SPECIES STATISTICS SECTION

Table 21. Hard clam gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20. In thousand of pounds & dollars.

Year	Total catch from patent tongs	Total value from patent tongs	Total catch from rakes	Total value from rakes
1929	836	308	76	28
30	1,018	322	132	44
31	523	174	101	36
32	1,032	234	180	41
33	719	152	91	23
34	1,615	150	168	25
35	1,042	222	170	41
36	2,101	290	94	19
37	1,096	175	-	-
38	1,037	98	344	47
39	706	115	308	51
40	609	115	443	82
41	521	111	392	82
42	843	264	139	49
44(1)	360	141	117	58
45	585	304	294	153
46	596	399	236	165
47	416	208	336	168
48	555	277	724	362
49	496	208	759	334
50	586	293	547	274
51	438	214	510	247
52	311	186	499	298
53	233	130	400	221
54	206	109	311	166
55	240	131	269	151
56	236	132	309	172
57	265	159	289	173
58	336	200	175	105
59	771	377	313	152
60	684	305	265	118
61	1,214	559	115	52
62	1,284	616	151	73
63	1,520	721	216	104
64	1,577	768	384	188
65	1,461	778	405	214
66	1,108	612	222	121
67	1,103	624	182	102
68	1,472	832	117	64
69	1,188	746	148	88
70	907	593	138	91
71	899	696	117	88
72	838	713	27	21
73	738	691	11	11
74	944	883	23	21
75	751	704	15	14
76	183	172	17	19
77	188	237	52	60
Average	800	364	241	111

See footnotes at end of table.

Table 21 continued. Hard clam gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

<u>Year</u>	<u>c/f Patent tongs</u>	<u>c/f Rakes</u>
1934	1.59(2)	1.39(2)
35	1.58	1.98
36	5.29	-(2)
37	3.11	-
38	4.30	1.43
39	2.29	1.87
40	1.62	1.37
41	1.85	1.54
42	2.93	.75
44(1)	.77	.20
45	1.30	.69
46	1.27	.62
47	1.07	.66
48	1.23	1.26
49	.98	1.27
50	1.11	.78
51	.83	.70
52	.63	.73
53	.45	.59
54	.29	.44
55	.32	.35
56	.31	.38
57	.37	.35
58	.27	.20
59	.88	.28
60	.78	.28
61	1.53	.17
62	1.62	.26
63	1.63	.29
64	1.59	.74
65	1.39	.92
66	1.15	-(2)
67	2.62	-
68	2.38	-
69	2.42	-
70	2.08	-
71	5.62	-
72	6.03	-
73	2.81	-
74	2.20	2.88
75	1.19	1.25
76	.41	1.31
77	.29	3.72
Average	1.73	.96

(1) 1943 data not available.

(2) No "number of gear" available for computations, 1929-33 for patent tongs and rakes, 1936 & 1937 for rakes, and 1966-1973 for rakes.

OYSTER

The oyster fishery had its greatest success per gear from 1937 to 1945. Landings over the 1929-58 period stayed fairly stable as dredge and tong c/f began a long-term slide in the late forties. The average c/f per tong increased in 1968 as the dredge c/f leveled off (Fig. 12). The overall landings trend has been downward since 1957 as MSX reduced the oyster populations and many bottoms became unproductive.

MSX, while affecting a major portion of productive oyster beds, did not eliminate the oyster fishery in other zones. After 1967, the remaining productive zones had dredge and tongs c/f's reflecting moderate success without any downward trend. Total landings however, continued to fall as less gear was used on the limited areas.

The average catch per oyster tong was 2.1 thousand pounds and the average catch per dredge was 28.5 thousand pounds for 1929-77 (Table 22). For 1968-77, dredge c/f averaged 13.1 thousand pounds (46% of the long-term), and tong c/f averaged 1.8 thousand pounds (85% if the long-term). The tremendous success of dredges in the early years was due to low numbers of gear working the best bottoms (Fig. 3). After the dredge fishery developed, the average c/f better reflected extant populations. Since the early c/f's were unrepresentative of the developed fishery, their inclusion in the long-term mean may not be justified. The last ten years (68-77) of dredge c/f represented 69% of the 1945-77 average.

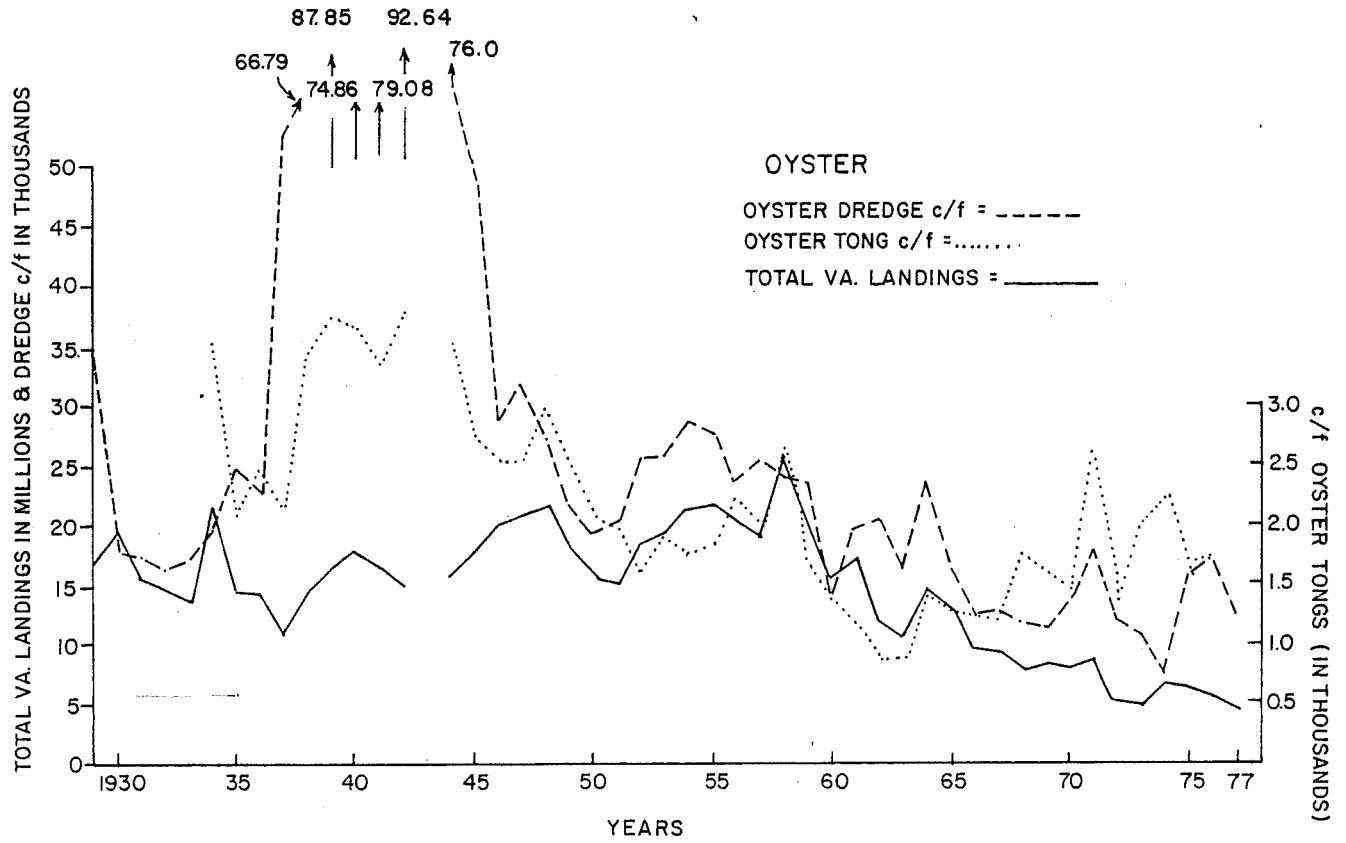


Figure 12. Oyster landings, oyster dredge c/f, and oyster tong c/f.

Table 22. Oyster gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20. In thousands of pounds & dollars.

<u>Year</u>	<u>Total catch from oyster dredges</u>	<u>Total value from oyster dredges</u>	<u>Total catch from oyster tongs</u>	<u>Total value from oyster tongs</u>
1929	5,115	704	11,434	1,339
30	4,606	560	14,272	1,667
31	2,892	240	12,318	1,025
32	4,167	309	9,775	687
33	5,043	383	7,833	502
34	6,304	459	15,253	930
35	7,123	525	6,151	397
36	5,666	457	7,311	640
37	2,802	215	6,281	434
38	4,475	353	7,128	636
39	6,325	529	8,282	656
40	6,887	633	8,411	726
41	6,643	829	7,357	1,052
42	7,226	1,460	5,816	926
44(1)	5,244	1,465	8,621	2,521
45	9,520	3,549	7,157	2,509
46	9,748	2,924	9,068	2,696
47	12,853	4,645	6,815	2,490
48	11,968	4,042	8,097	2,650
49	11,354	3,780	6,008	1,992
50	10,361	3,741	4,789	1,689
51	10,211	3,589	4,539	1,583
52	13,779	5,800	3,902	1,709
53	14,525	5,714	4,328	1,689
54	15,688	7,322	4,790	2,163
55	16,440	7,503	4,737	2,100
56	14,920	6,992	5,966	2,738
57	14,434	7,066	5,253	2,569
58	18,914	10,316	6,468	3,749
59	16,119	10,099	5,112	3,197
60	10,891	7,713	4,380	3,123
61	13,654	11,030	3,437	2,850
62	9,676	8,013	2,056	1,705
63	8,089	6,218	2,344	1,827
64	10,385	7,620	3,483	2,513
65	7,813	6,533	4,529	3,554
66	4,544	3,264	4,899	3,230
67	4,802	3,074	4,266	2,885
68	3,465	2,301	4,340	2,968
69	3,093	2,099	4,344	2,887
70	4,433	3,018	3,610	2,409
71	4,945	3,374	3,496	2,136
72	3,117	2,097	1,898	1,144
73	2,625	1,783	2,331	1,375
74	3,221	2,399	3,517	2,445
75	2,814	2,297	3,382	2,665
76	2,482	2,574	2,364	2,353
77	1,536	1,933	2,572	2,862
Average	7,978	3,615	5,928	1,971

See footnotes at end of table.

Table 22 continued. Oyster gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

<u>Year</u>	<u>c/f</u> <u>Oyster dredges</u>	<u>c/f</u> <u>Oyster tongs</u>
1929	34.10	-(2)
30	17.99	-
31	17.63	-
32	16.28	-
33	16.92	-
34	19.95	3.51
35	24.56	2.13
36	22.94	2.45
37	52.87	2.18
38	66.79	3.40
39	87.85	3.75
40	74.86	3.65
41	79.08	3.38
42	92.64	3.76
44(1)	76.00	3.53
45	48.82	2.72
46	28.50	2.58
47	31.27	2.55
48	27.02	2.92
49	21.67	2.48
50	19.15	2.10
51	20.14	1.95
52	25.76	1.59
53	25.94	1.86
54	28.73	1.76
55	27.26	1.82
56	23.61	2.21
57	25.02	2.02
58	24.85	2.67
59	23.50	1.66
60	14.13	1.39
61	19.51	1.12
62	20.24	.88
63	16.02	.89
64	23.39	1.38
65	16.38	1.25
66	11.80	1.23
67	12.81	1.18
68	11.79	1.72
69	11.41	1.61
70	13.68	1.48
71	17.92	2.59
72	11.99	1.39
73	10.46	1.96
74	7.71	2.24
75	15.72	1.69
76	17.24	1.56
77	13.36	1.44
Average	28.49	2.13

(1) 1943 data not available.

(2) No "number of gear" available for computations, 1929-33.

BLUE CRAB

The blue crab fishery has been one of Virginia's most important, with an average 35 million pounds (whole crabs) landed per year 1929-77. Pots, pound nets, and dredges are the main gears. From 1936-48, average c/f rose for pound nets but fell for crab pots, then both declined steadily through the fifties. Landings followed the declining success of the principal gears until 1957 (Fig. 13 & Table 23). During the mid-fifties the number of pots and pound nets increased rapidly in number (Fig. 4) and total landings rose to all time highs. The average c/f however continued to fall with lesser slope until 1965. These data indicate the crab fishery had approached maximum expansion by the mid-fifties, and as more and more operating units entered the fishery, the resource was overexploited. Total landings remained high during the sixties because of the tremendous amount of fishing effort. Crab pot c/f continued its downward trend and pound net c/f plummeted after 1967.

The overexpansion of the crab fishery during falling c/f put a strain on the resource that it could not sustain without successively strong year classes and subsequent recruitment. For several years the situation remained stable, then the extremely strong 1964 year class pushed landings and pound net c/f to high levels. The fishery expanded continuously during this period and the crash was eminent. The fishery may be capable of sustained landings of 30-40 million pounds per year, but it presently takes 2-3 times the total fishing effort as in earlier years. This of course increases the cost of fishing and all participants must work harder with greater gear investment than if gear success was higher.

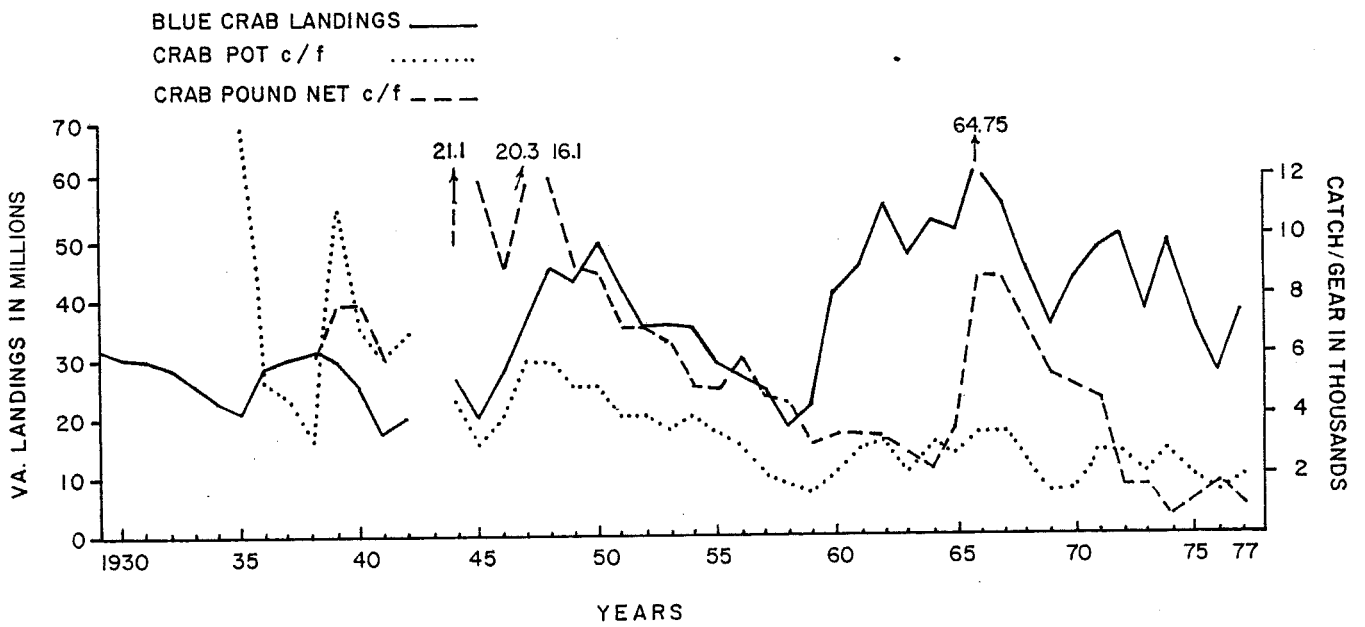


Figure 13. Blue Crab landings, crab pot c/f, and crab pound net c/f.

Table 23. Blue crab gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20. In thousand of pounds & dollars.

<u>Year</u>	<u>Total catch from crab pound nets</u>	<u>Total value from crab pound nets</u>	<u>Total catch from crab pots</u>	<u>Total value from crab pots</u>
1929	6	1	-	-
30	-	-	-	-
31	-	-	-	-
32	-	-	-	-
33	-	-	-	-
34	-	-	-	-
35	-	-	56	1
36	1	1	141	5
37	-	-	490	13
38	256	29	252	4
39	231	10	1,245	30
40	300	18	5,099	94
41	337	44	5,787	171
42	335	23	8,039	235
44(1)	511	112	11,208	608
45	383	109	13,339	879
46	556	176	16,880	1,093
47	1,285	313	22,012	1,009
48	1,306	254	27,322	1,428
49	939	155	25,434	1,163
50	1,220	152	30,525	1,032
51	994	161	23,199	740
52	900	117	20,698	717
53	931	143	19,848	735
54	883	129	21,099	767
55	952	155	17,424	801
56	1,067	163	14,993	839
57	996	261	18,984	1,143
58	1,067	179	13,567	736
59	843	208	14,938	1,126
60	908	216	27,442	1,434
61	1,009	235	31,966	1,487
62	969	258	37,127	1,831
63	654	159	27,709	1,638
64	600	182	35,949	2,578
65	896	261	39,283	3,058
66	2,270	261	41,429	2,593
67	2,379	336	36,367	1,899
68	1,527	242	31,294	3,596
69	1,227	175	24,003	2,547
70	1,283	113	28,514	1,734
71	681	136	35,619	2,896
72	253	105	36,403	2,958
73	179	81	28,333	3,107
74	173	83	33,266	3,593
75	250	122	30,658	4,479
76	362	249	20,022	5,000
77	242	181	31,563	5,863
Average	784	154	21,655	1,611

See footnotes at end of table.

Table 23 continued. Blue crab gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

<u>Year</u>	<u>Total catch from crab dredges</u>	<u>Total value from crab dredges</u>	<u>Total catch from crab trot lines</u>	<u>Total value from crab trot lines</u>
1929	7,073	178	21,452	354
30	7,494	149	20,113	373
31	7,214	100	21,355	284
32	8,211	104	18,302	182
33	6,555	111	17,047	170
34	5,597	172	16,862	287
35	4,792	176	14,686	308
36	6,260	183	19,548	386
37	4,903	175	22,334	379
38	5,392	148	22,940	361
39	4,088	115	21,437	359
40	3,534	141	14,579	285
41	2,117	99	7,919	220
42	2,665	99	7,905	226
44(1)	2,178	193	10,640	616
45	2,260	139	3,006	193
46	3,573	214	6,449	411
47	3,436	362	9,099	426
48	4,518	456	11,169	585
49	6,407	487	8,976	620
50	7,682	606	8,342	281
51	8,692	596	5,971	196
52	7,613	501	5,363	192
53	7,098	693	5,510	208
54	6,238	381	5,275	193
55	5,172	470	4,393	204
56	7,177	716	3,609	259
57	2,801	317	3,188	197
58	2,271	189	1,887	98
59	4,644	348	1,720	126
60	10,545	628	1,682	86
61	9,083	403	3,086	147
62	13,033	598	3,593	178
63	16,525	894	1,979	107
64	13,135	797	2,608	173
65	9,434	667	1,907	144
66	15,244	753	5,414	319
67	14,978	980	1,852	92
68	9,873	1,011	2,603	299
69	7,695	755	2,073	202
70	10,559	593	2,570	152
71	10,962	854	1,124	87
72	12,349	1,135	155	16
73	8,881	1,258	42	7
74	8,084	937	-	-
75	4,469	740	53	7
76	6,158	1,283	109	27
77	6,144	1,292	1	1
Average	7,183	504	7,913	504

See footnotes at end of table.

Table 23 continued. Blue crab gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

<u>Year</u>	<u>c/f Crab pound nets</u>	<u>c/f Crab pots</u>	<u>c/f Crab dredges</u>	<u>c/f Crab trot lines</u>
1929	-(2)	-(2)	57.04	20.16
30	-	-	73.47	14.51
31	-	-	64.41	19.52
32	-	-	65.17	18.41
33	-	-	50.42	15.86
34	-	-	27.99	11.73
35	-	1.22	22.71	11.26
36	-	.51	26.98	9.14
37	-	.46	24.76	11.38
38	.60	.34	18.22	14.31
39	.77	1.11	22.46	15.42
40	.77	.71	22.09	11.49
41	.63	.62	15.80	9.38
42	.70	.67	26.65	14.17
44(1)	2.11	.44	20.74	19.63
45	1.20	.35	13.45	13.24
46	.94	.40	17.18	12.62
47	2.03	.58	12.97	18.46
48	1.61	.59	15.69	19.06
49	.89	.50	18.90	14.16
50	.87	.50	28.66	17.94
51	.69	.40	29.57	12.84
52	.68	.40	25.63	11.74
53	.64	.36	25.08	11.36
54	.56	.40	21.22	15.94
55	.53	.35	12.90	14.69
56	.60	.33	18.31	15.29
57	.46	.22	7.80	13.23
58	.44	.17	7.50	7.49
59	.33	.15	16.89	6.75
60	.36	.20	31.29	6.78
61	.36	.28	20.18	14.70
62	.35	.32	33.94	30.71
63	.23	.21	40.70	13.65
64	.21	.30	36.29	20.06
65	.36	.28	29.12	20.29
66	.87	.32	51.15	75.19
67	.85	.32	52.93	30.87
68	.73	.23	30.85	34.71
69	.54	.16	25.65	44.11
70	.66	.17	32.59	38.94
71	.47	.27	38.46	8.39
72	.16	.26	45.23	1.06
73	.16	.21	27.75	7.00
74	.06	.27	51.17	-
75	.11	.20	25.83	8.83
76	.18	.13	26.66	21.80
77	.09	.19	23.19	.07
Average	.64	.38	29.87	16.99

(1) 1943 data not available.

(2) No "number of gear" available for computations, 1929-37 for crab pound nets and 1929-34 for crab pots.

STRIPED BASS

Haul seines and pound nets are the primary gears for striped bass (Table 24). Their yearly c/f's have been very similar in measuring the abundance of bass in Virginia waters 1929-77 (Fig. 14). The correspondence between c/f and the total yield indicates the landings are highly dependent on the success of these gears. This indicates the actual effort over decreasing net number (Fig. 7) since 1945. If the use of each haul seine would have been increased during periods of falling success, landings would have held up.

Fyke net catches of striped bass have been a poor indicator of population size or landings trends in general (Table 24). While fyke nets may have shared in the periods of high abundance, their collaboration of fluctuations as shown by haul seines and pound nets has been weak, and often several years out of phase. Their usefulness as measures of striped bass abundance is thus limited because they are an incidental gear.

Stake gill nets averaged 386 thousand pounds per year, or 350 pounds per net from 1929-77. The c/f of stake gill nets confirmed the index for haul seines and pound nets in all major aspects. When striped bass were plentiful, 500-700 pounds were captured per gear by the average net. The stake gill net fishery has increased in complexity and size since the fifties but has experienced wide swings in gear number year to year. The recent fishery (last 10 years) remains approximately $\frac{1}{4}$ the size of the 1929-44 period however.

Since the three major gears have shown the same fluctuations in yearly c/f, and these fluctuations have in turn been closely correlated with landings and trends; this indicates landings can reliably reflect striped bass abundance and trends. Any limits on gear number of use would have decreased total landings, but not changed the cyclical pattern or arrested the major declines of the early fifties and seventies.

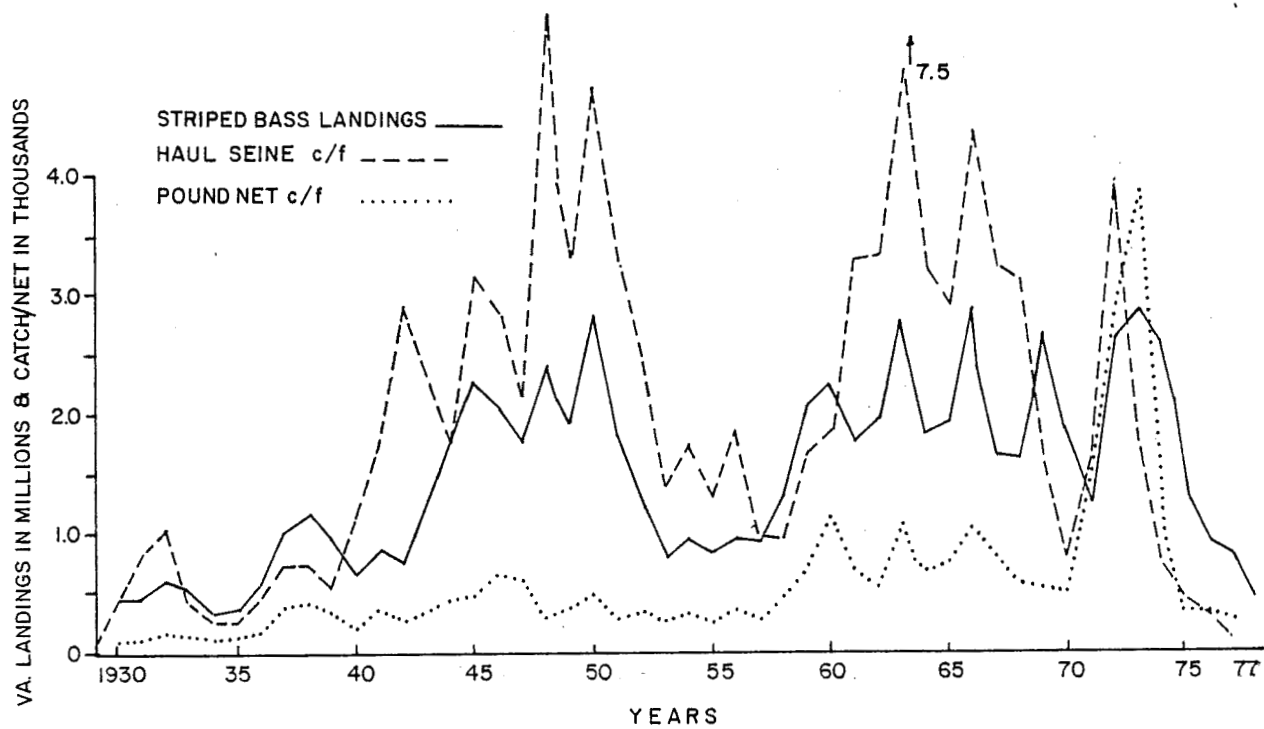


Figure 14. Striped Bass landings, haul seine c/f for bass, and pound net c/f for bass.

Table 24. Striped bass gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20. In thousands of pounds & dollars.

<u>Year</u>	<u>Total catch from haul seines</u>	<u>Total value from haul seines</u>	<u>Total catch from pound nets</u>	<u>Total value from pound nets</u>
1929	16	3	148	26
30	66	10	193	31
31	108	15	218	25
32	94	11	327	39
33	81	9	303	39
34	44	3	182	17
35	38	3	228	23
36	61	2	335	21
37	99	7	624	35
38	106	8	774	59
39	86	7	611	50
40	149	14	311	30
41	225	20	519	44
42	334	29	293	26
44(1)	628	79	576	69
45	815	130	635	102
46	844	127	702	105
47	587	112	697	131
48	1,684	216	419	63
49	1,074	127	481	60
50	1,582	204	620	82
51	930	135	365	56
52	509	77	309	48
53	276	40	208	32
54	324	49	238	35
55	255	51	175	34
56	340	53	232	36
57	197	32	187	30
58	176	27	326	53
59	381	62	524	78
60	408	57	927	131
61	584	85	456	74
62	595	84	362	52
63	1,085	140	789	104
64	548	88	599	95
65	452	86	728	147
66	697	127	1,032	197
67	455	70	655	102
68	409	75	366	64
69	221	43	723	143
70	126	27	392	84
71	126	30	535	128
72	371	77	967	190
73	121	35	1,340	329
74	74	20	483	113
75	47	17	141	63
76	46	22	124	59
77	7	4	119	59
Average	385	57	469	75

See footnote at end of table.

Table 24 continued. Striped bass gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

<u>Year</u>	<u>Total catch from fyke nets</u>	<u>Total value from fyke nets</u>	<u>Total catch from stake gill nets</u>	<u>Total value from stake gill nets</u>
1929	17	4	46	10
30	58	9	63	10
31	45	4	64	9
32	36	4	83	10
33	30	3	63	8
34	22	2	35	4
35	29	3	52	7
36	35	4	74	7
37	54	3	203	16
38	62	5	205	18
39	17	2	234	19
40	44	4	149	15
41	48	6	68	7
42	53	7	87	8
44 ⁽¹⁾	67	8	538	65
45	155	25	465	74
46	112	17	333	50
47	189	37	216	43
48	123	19	204	32
49	168	24	175	20
50	249	36	322	45
51	218	37	279	46
52	161	25	254	41
53	110	17	199	31
54	143	21	233	39
55	126	25	318	63
56	102	16	289	51
57	142	23	380	61
58	180	28	604	96
59	226	41	951	146
60	166	23	721	97
61	99	16	696	111
62	220	31	610	88
63	129	16	698	91
64	185	32	523	81
65	133	26	756	146
66	178	35	811	151
67	103	16	402	60
68	116	21	565	102
69	135	27	296	58
70	53	11	418	89
71	55	13	257	63
72	4	1	536	126
73	11	3	572	149
74	1	1	1,374	267
75	13	5	731	331
76	3	1	660	325
77	-	-	694	366
Average	98	16	386	78

See footnote at end of table.

Table 24 continued. Striped bass gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

<u>Year</u>	<u>c/f Haul seines</u>	<u>c/f Pound nets</u>	<u>c/f Fyke nets</u>	<u>c/f Stake gill nets</u>
1929	.08	.07	.02	.003
30	.35	.09	.05	.004
31	.82	.10	.05	.01
32	1.03	.16	.05	.01
33	.42	.16	.05	.01
34	.24	.10	.03	.01
35	.25	.11	.04	.01
36	.35	.18	.06	.02
37	.71	.38	.07	.03
38	.72	.41	.10	.04
39	.56	.32	.02	.05
40	1.10	.19	.05	.03
41	1.73	.34	.06	.01
42	2.96	.26	.13	.02
44(1)	1.74	.42	.14	.06
45	3.15	.48	.24	.75
46	2.81	.54	.19	.63
47	2.17	.50	.25	.44
48	5.30	.28	.16	.40
49	3.38	.37	.22	.29
50	4.72	.47	.29	.51
51	3.24	.30	.26	.45
52	2.30	.33	.20	.35
53	1.43	.24	.16	.25
54	1.71	.30	.21	.25
55	1.19	.24	.21	.32
56	1.85	.38	.17	.30
57	.98	.27	.29	.37
58	.95	.49	.42	.57
59	1.69	.70	.35	.76
60	1.95	1.19	.30	.65
61	3.30	.71	.12	.62
62	3.50	.54	.43	.52
63	7.75	1.11	.27	.55
64	3.21	.65	.33	.39
65	2.92	.75	.24	.46
66	4.36	1.03	.49	.53
67	3.20	.78	.32	.25
68	3.10	.57	.43	.49
69	1.61	1.01	.50	.25
70	.80	.49	.20	.30
71	1.37	1.60	.21	.62
72	3.99	2.98	.02	1.29
73	1.78	3.87	.07	.94
74	.78	1.25	.01	.60
75	.42	.35	.08	.75
76	.34	.33	.02	.35
77	.08	.28	-	.33
Average	1.97	.60	.18	.35

(1) 1943 data not available.

CROAKER

Croaker catches ran 23-55 million pounds per year from 1935-48. The haul seine and pound net c/f tracked landings very closely, but pound net c/f had less variation (Fig. 15). The first large drop in abundance occurred 1949-54, followed by several strong years in the late fifties. Then the croaker stocks plummeted to commercial insignificance for the next ten years. What caused the croaker stocks to fall and stay low for such a long period has never been determined. The decline occurred throughout the Southeast, which indicates Virginia was reflecting a part of a larger situation.

By the early seventies, young croaker began to appear again in commercial and experimental nets. Within several years the waters were full of croaker, large, medium, and small. By 1977 it was safe to say the croaker had returned, as total landings exceeded 8 million pounds for the first time in 19 years (Table 25).

The correspondence between pound net c/f and haul seine c/f for croaker has been remarkably close. Either gear could serve to measure relative population size. Landings alone would tend to overestimate the population when high, and underestimate the population during increasing stock size.

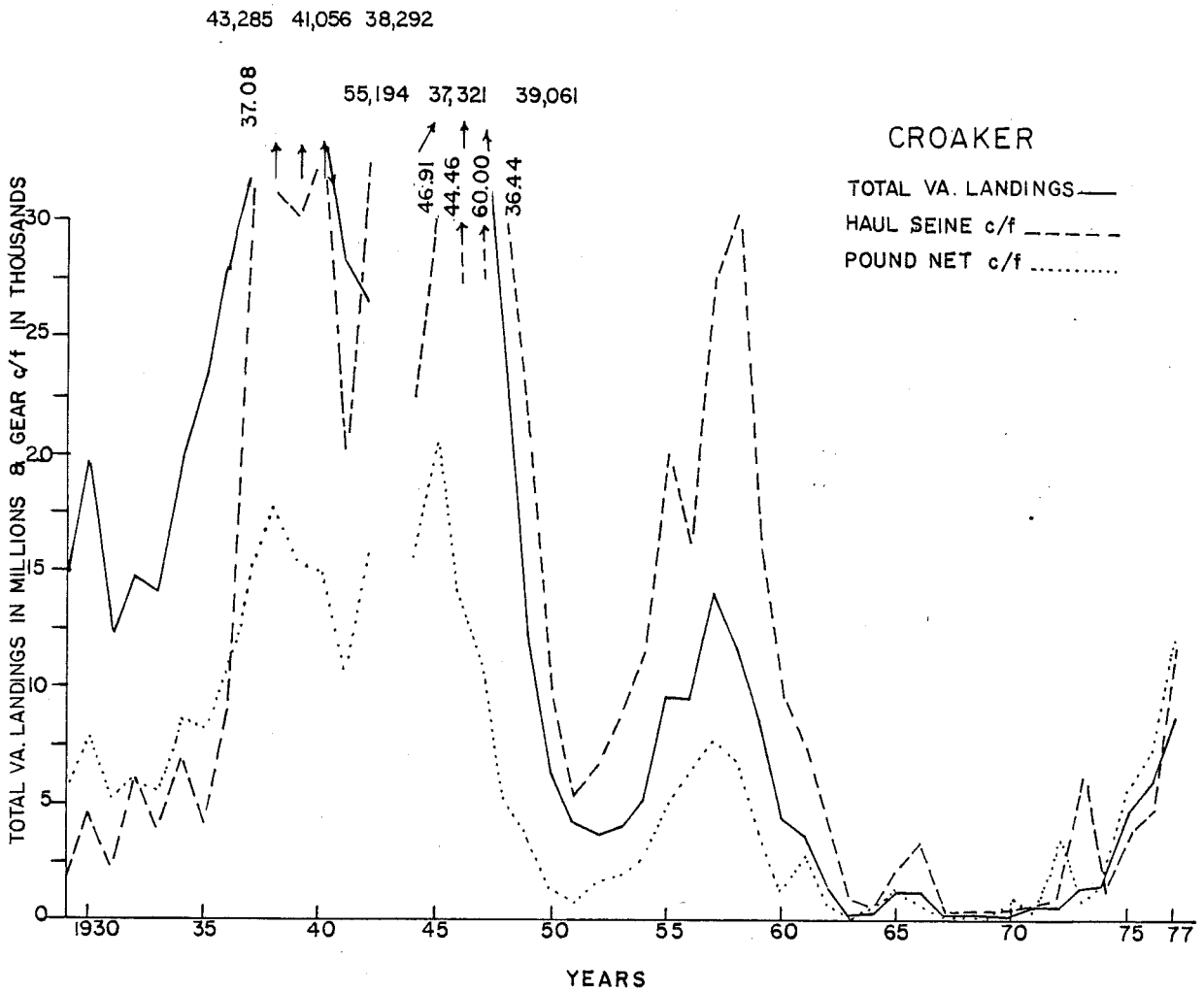


Figure 15. Croaker landings, haul seine c/f for croaker, and pound net c/f for croaker.

Table 25. Croaker gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20. In thousands of pounds & dollars.

Year	Total catch from haul seines	Total value from haul seines	Total catch from pound nets	Total value from pound nets	Total catch from anchor gill nets
1929	273	11	13,080	306	-
30	931	24	17,492	390	18
31	273	7	11,543	221	-
32	576	10	12,359	201	-
33	712	10	10,882	131	-
34	1,265	16	15,700	166	-
35	612	7	16,567	185	-
36	1,640	16	21,316	160	10
37	5,154	83	25,133	348	65
38	4,636	56	33,081	407	-
39	4,713	69	29,938	427	-
40	4,497	63	24,866	339	-
41	3,667	67	16,479	315	-
42	3,684	69	17,938	317	-
44(1)	8,154	352	21,168	1,113	-
45	12,150	1,337	27,602	3,036	964
46	13,338	1,334	18,398	1,840	648
47	16,199	1,484	15,370	1,537	122
48	11,589	1,312	7,983	963	129
49	6,609	983	4,104	614	21
50	3,268	549	1,939	387	8
51	1,610	247	1,170	186	2
52	1,485	182	1,409	164	5
53	1,685	172	1,599	160	2
54	2,201	230	2,138	202	60
55	4,325	346	3,386	271	123
56	2,996	230	3,739	308	104
57	5,580	602	5,290	593	260
58	5,651	515	3,892	355	205
59	3,645	566	2,853	460	197
60	2,081	302	1,052	194	239
61	1,175	219	1,687	305	38
62	722	161	441	101	21
63	12	3	11	3	2
64	83	13	235	35	3
65	318	32	1,041	109	53
66	522	68	674	91	91
67	89	15	163	30	23
68	1	1	2	1	1
69	34	5	18	3	2
70	32	4	71	9	13
71	67	9	120	16	13
72	88	13	238	34	46
73	442	49	353	45	177
74	100	17	709	106	8
75	395	50	2,320	257	21
76	626	85	2,781	384	589
77	930	102	4,930	485	1,175
Average	2,934	252	8,443	381	152

See footnote at end of table.

Table 25 continued. Croaker gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

Year	Total value from anchor gill nets	c/f Haul seines	c/f Pound nets	c/f Anchor gill nets
1929	-	1.39	5.97	-
30	1	4.98	7.73	18.00
31	-	2.04	5.23	-
32	-	6.33	6.12	-
33	-	3.73	5.79	-
34	-	6.91	8.67	-
35	-	4.03	8.28	-
36	1	9.32	11.21	5.00
37	1	37.08	15.18	21.67
38	-	31.32	17.68	-
39	-	30.41	15.50	-
40	-	33.31	15.29	-
41	-	20.21	10.88	-
42	-	32.60	15.65	-
44(1)	-	22.53	15.53	-
45	106	46.91	20.72	11.21
46	65	44.46	14.03	6.17
47	12	60.00	10.97	.70
48	15	36.44	5.36	1.04
49	3	20.78	3.17	.38
50	2	9.76	1.47	.16
51	1	5.61	.97	.18
52	1	6.72	1.51	.39
53	1	8.73	1.86	.40
54	6	11.58	2.73	1.18
55	9	20.21	4.70	1.89
56	9	16.28	6.19	2.97
57	30	27.76	7.72	2.86
58	18	30.55	5.86	1.86
59	31	16.13	3.79	1.08
60	46	9.96	1.35	1.45
61	7	6.64	2.62	.03
62	5	4.25	.66	.02
63	1	.09	.02	.002
64	1	.49	.26	.002
65	5	2.05	1.08	.03
66	13	3.26	.67	.06
67	4	.63	.20	.01
68	1	.01	.003	.001
69	1	.25	.03	.002
70	2	.20	.09	.01
71	2	.73	.36	.03
72	6	.95	.73	.11
73	19	6.50	1.02	.29
74	1	1.05	1.84	.003
75	3	3.53	5.69	.02
76	88	4.60	7.44	.31
77	119	11.21	11.49	.56
Average	18	13.84	6.07	

(1) 1943 data not available.

AMERICAN SHAD

Total landings of shad have fallen from above 6 million pounds per year 1929-32, to 1.5-3 million 1961-74, (Fig. 16). Over the 49 year period, the pound net c/f has oscillated similar to the landings, but has shown only a moderate downward trend. Stake gill net c/f has followed the pound net changes only weakly.

From 1960-71 pound net c/f indicated high shad abundance but stake gill nets indicated low abundance. After 1971 the two gears reflected opposite amounts in every year. Drift gill nets (Table 26) have followed pound nets better than stake gill nets. After the peak in drift gill net c/f in 1973, the fishery expanded by ten-fold, (in licensed units) and subsequent poor years led to extreme low yearly c/f's.

The landings fluctuations are in part due to the highly variable nature of total effort capable by the gill net fishery. When early spring catches are good and prices high, the fishery can expand very rapidly. This can result in high yearly landings, when the number of licensed units may have changed only slightly from the previous years. If catches remain moderate to good, the weakly effort (e.g. number of sets and lifts) can be several times more intense than when fish are scarce.

The combined c/f's of the three major gears indicate shad have declined in abundance since 1972. The landings alone reflect the decline. Pound nets though remain the best single gear for measuring shad abundance.

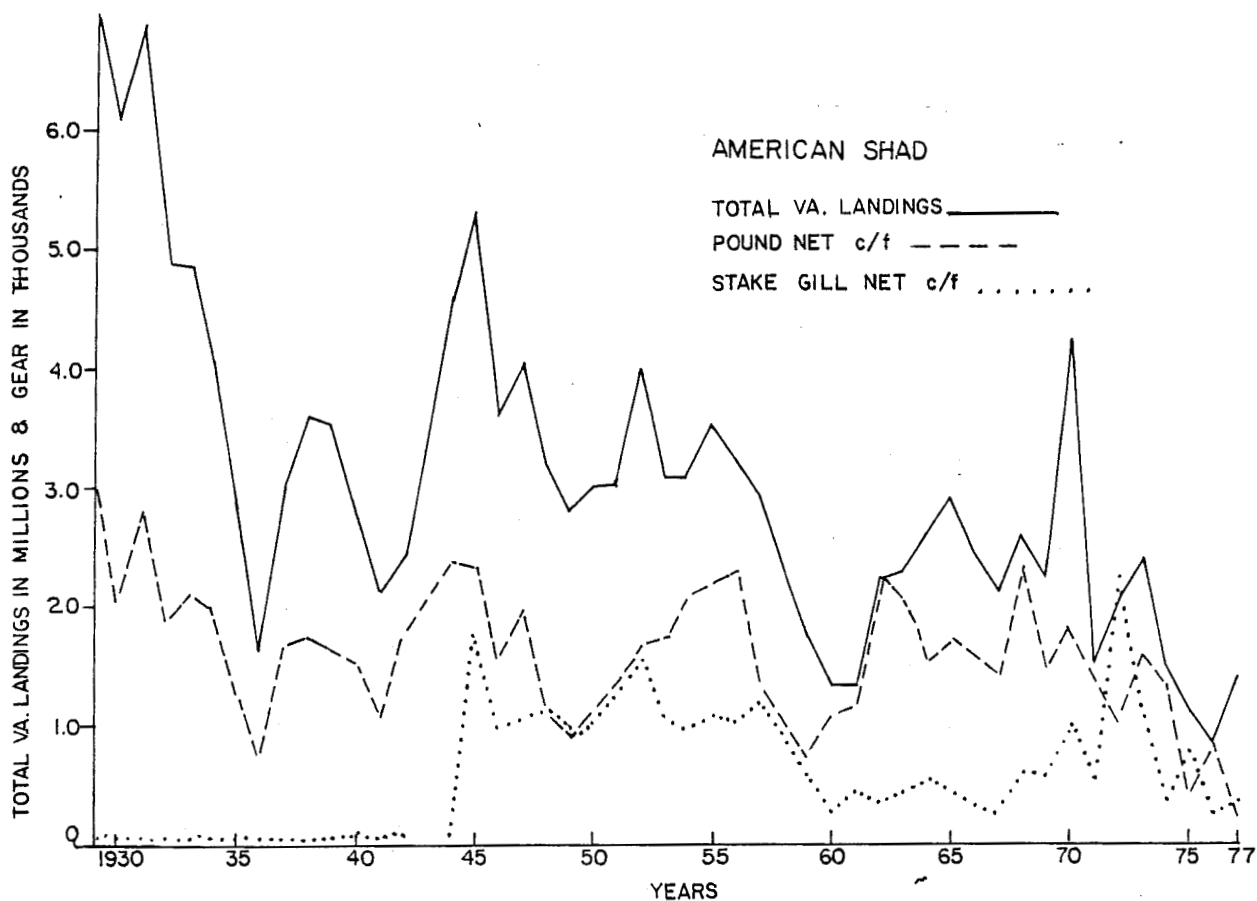


Figure 16. American Shad landings, pound net c/f for shad, and stake gill net c/f for shad.

Table 26. American shad gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20. In thousands of pounds & dollars.

Year	Total catch from pound nets	Total value from pound nets	Total catch from stake gill nets	Total value from stake gill nets	Total catch from drift gill nets
1929	6,672	1,164	562	113	696
30	4,640	751	711	111	758
31	6,122	722	505	67	643
32	3,819	345	445	34	564
33	3,903	371	373	28	530
34	3,543	258	299	31	214
35	2,491	234	208	23	162
36	1,375	153	86	10	119
37	2,782	242	149	15	136
38	3,242	297	125	14	206
39	3,183	290	177	19	175
40	2,435	274	190	22	131
41	1,653	138	248	30	159
42	2,033	172	193	21	136
44(1)	3,251	388	620	73	623
45	3,069	564	1,071	203	968
46	1,995	341	520	95	927
47	2,709	450	525	105	622
48	1,763	295	569	94	678
49	1,221	183	595	87	728
50	1,574	261	647	107	587
51	1,651	282	780	137	603
52	1,559	232	1,188	185	947
53	1,454	252	869	148	576
54	1,624	311	911	163	476
55	1,551	264	1,084	184	730
56	1,361	200	1,015	138	648
57	938	152	1,242	212	652
58	675	126	962	174	512
59	561	98	717	124	430
60	723	127	317	54	264
61	646	108	486	85	173
62	1,489	208	421	60	238
63	1,453	218	540	81	282
64	1,396	173	691	82	436
65	1,625	171	766	78	422
66	1,571	140	476	44	340
67	1,176	102	462	40	368
68	1,445	93	667	42	280
69	1,034	78	653	47	407
70	1,404	112	1,399	105	851
71	475	41	231	18	712
72	353	35	938	109	672
73	542	80	704	100	1,089
74	519	70	817	125	198
75	188	43	664	196	256
76	271	73	546	197	78
77	119	27	710	258	638
Average	1,902	244	606	94	480

See footnote at end of table.

Table 26 continued. American shad gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

<u>Year</u>	<u>Total value from drift gill nets</u>	<u>c/f Pound nets</u>	<u>c/f Stake gill nets</u>	<u>c/f Drift gill nets</u>
1929	93	3.05	.04	.92
30	116	2.05	.04	1.16
31	72	2.77	.04	1.19
32	42	1.89	.06	1.23
33	40	2.08	.08	1.29
34	20	1.96	.04	.69
35	16	1.25	.03	.49
36	12	.72	.02	.59
37	13	1.68	.03	.61
38	19	1.73	.03	.88
39	17	1.65	.04	.75
40	15	1.50	.04	.38
41	20	1.09	.05	.53
42	16	1.77	.04	.59
44(1)	72	2.39	.06	.45
45	167	2.30	1.73	1.37
46	166	1.52	.98	1.21
47	122	1.93	1.06	.87
48	113	1.18	1.10	1.14
49	109	.94	.97	1.18
50	94	1.19	1.03	1.12
51	116	1.37	1.24	1.15
52	145	1.67	1.63	1.80
53	97	1.70	1.07	.94
54	84	2.08	.97	.80
55	124	2.15	1.09	1.07
56	88	2.25	1.05	.97
57	109	1.37	1.20	1.09
58	87	1.02	.91	.81
59	73	.75	.58	.63
60	46	.93	.28	.44
61	26	1.01	.43	.33
62	33	2.24	.36	.59
63	42	2.04	.42	.51
64	55	1.52	.51	.68
65	44	1.68	.46	.50
66	31	1.57	.31	.41
67	29	1.41	.29	.50
68	17	2.26	.57	.50
69	29	1.45	.56	.72
70	64	1.77	.99	1.19
71	66	1.42	.56	2.61
72	70	1.09	2.25	2.20
73	171	1.57	1.16	5.04
74	28	1.35	.35	.07
75	62	.46	.68	.06
76	14	.73	.29	.04
77	213	.28	.34	.21
Average	69	1.58	.59	.93

(1) 1943 data not available.

CATFISH

The catfish fishery includes channel catfish, white catfish, and bullheads. The species are not separated in the commercial statistics, so we are unable to comment specifically about each from NMFS data. The majority (about 80%) of landings are of channel catfish because of its fine flavor and high market demand.

Fyke nets and catfish pots have been the dominant gear although substantial catch is often landed with haul seines, pound nets, and trot lines (Table 27). The pot fishery has averaged 728 thousand pounds per year (310 pounds per pot) while the fyke nets have averaged 380 thousand pounds per year, or 780 pounds per net per year for 1929-77. The c/f's for the two have been unrelated since 1952 (Fig. 17). Fyke nets have had the same fluctuations as total landings but catfish pots have indicated a very stable but declining fishery. Trot lines, and haul seines although secondary gear, have followed the fyke net pattern very closely. This indicates the average pot catch, or their yearly c/f cannot be depended on to measure the catfish stocks.

The catfish fishery peaked in the late fifties then fell off steadily until 1965. Since 1965 the total landings have risen erratically upward while fyke net c/f has fluctuated violently. The 1976+ ban on channel catfish in the James River erased a principle fyke net fishery while the numbers licensed stayed high, thus showing lower c/f's than the stock size warranted.

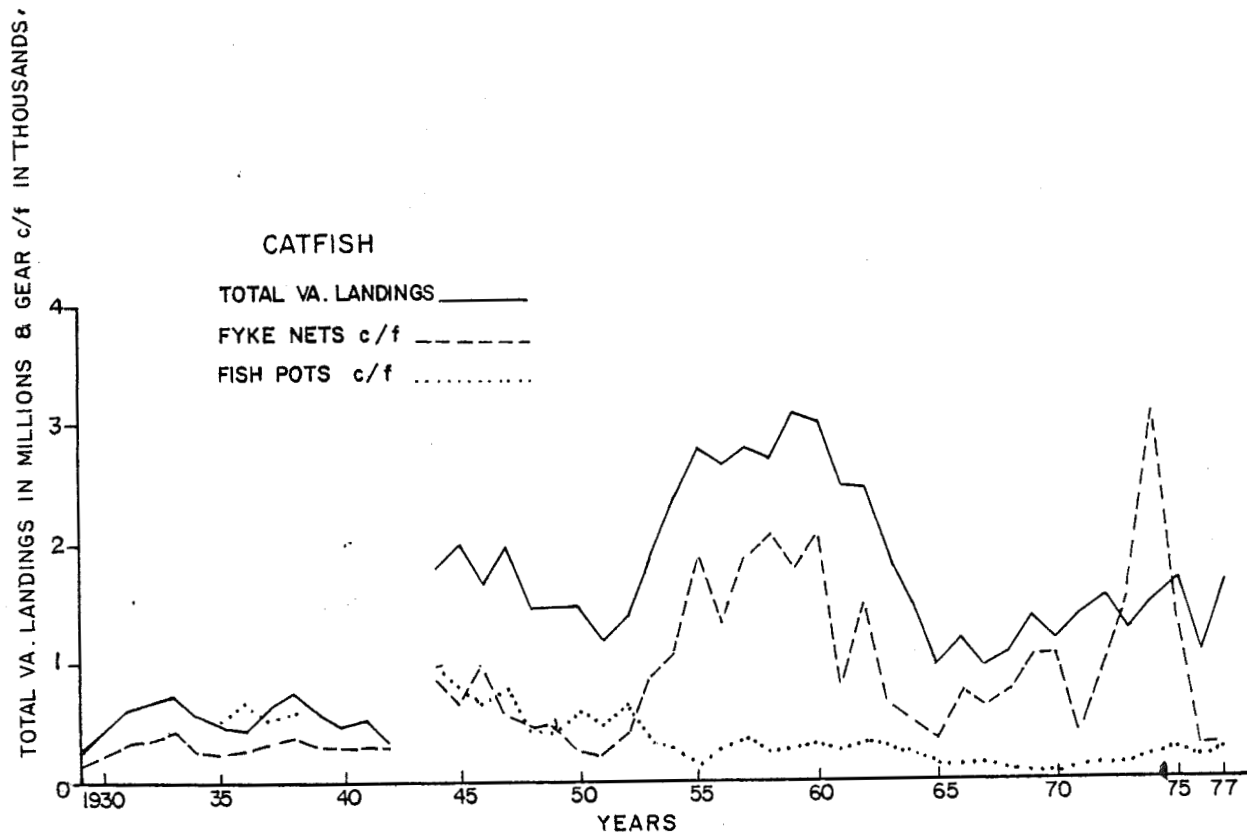


Figure 17. Catfish landings, fyke net c/f for catfish, and fish pot c/f for catfish.

Table 27. Catfish gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20. (1) In thousands of pounds & dollars.

<u>Year</u>	<u>Total catch from haul seines</u>	<u>Total value from haul seines</u>	<u>Total catch from pound nets</u>	<u>Total value from pound nets</u>	<u>Total catch from fyke nets</u>
1929	89	5	35	2	121
30	139	5	32	2	236
31	304	13	41	2	265
32	248	8	214	6	231
33	241	8	203	6	264
34	76	3	211	9	205
35	86	3	123	4	154
36	71	2	75	2	176
37	83	3	159	5	239
38	106	4	178	7	231
39	102	4	158	7	325
40	97	4	109	5	264
41	97	5	113	4	255
42	72	4	61	3	115
44(2)	156	11	246	16	394
45	322	29	230	21	423
46	266	21	138	11	561
47	148	12	327	26	413
48	158	11	169	12	366
49	181	13	225	16	380
50	154	14	154	14	220
51	168	12	49	3	168
52	219	13	78	5	294
53	249	18	268	19	597
54	220	16	269	18	718
55	228	14	222	13	1,147
56	182	11	358	21	794
57	278	25	172	16	909
58	295	24	140	19	884
59	259	17	92	6	1,157
60	301	21	181	12	1,124
61	286	18	68	4	596
62	188	12	161	11	752
63	134	9	20	1	288
64	211	15	61	4	256
65	103	10	23	2	199
66	99	11	115	14	256
67	103	14	20	3	195
68	109	15	7	1	195
69	122	17	20	3	281
70	107	16	28	4	291
71	589	86	13	1	105
72	302	45	94	13	240
73	335	60	137	21	238
74	190	42	91	17	432
75	172	37	110	19	209
76	126	22	119	20	37
77	55	11	407	72	42
Average	184	17	136	11	380

See footnotes at end of table.

Table 27 continued. Catfish gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

Year	Total value from fyke nets	Total catch from fish pots	Total value from fish pots	Total catch from trot lines	Total value from trot lines
1929	6	-	-	-	-
30	9	-	-	-	-
31	11	-	-	-	-
32	7	-	-	-	-
33	8	-	-	-	-
34	9	-	-	1	1
35	5	70	2	-	-
36	5	88	3	7	1
37	8	112	5	6	1
38	9	129	5	2	1
39	16	-	-	-	-
40	11	-	-	-	-
41	12	29	2	-	-
42	7	45	3	13	1
44(2)	34	947	96	6	1
45	37	944	85	42	4
46	45	665	53	16	1
47	33	1,030	82	28	2
48	26	728	51	12	1
49	26	633	43	17	1
50	19	836	75	62	6
51	13	672	52	70	6
52	18	745	45	91	6
53	45	613	43	110	8
54	53	947	69	135	10
55	69	956	57	168	10
56	48	1,161	70	120	7
57	71	1,281	94	90	7
58	70	1,276	103	70	6
59	77	1,336	87	222	15
60	75	1,133	73	239	16
61	45	1,405	89	105	7
62	50	1,204	80	98	7
63	19	1,144	77	166	11
64	18	862	58	69	5
65	19	555	53	58	6
66	30	630	82	51	6
67	27	530	69	87	12
68	28	644	92	111	16
69	36	785	104	135	18
70	44	597	90	112	17
71	15	552	81	98	14
72	34	772	119	85	13
73	43	427	86	51	9
74	82	425	92	242	53
75	47	668	144	361	114
76	8	656	142	128	58
77	9	872	196	178	50
Average	30	728	71	94	14

See footnotes at end of table.

Table 27 continued. Catfish gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

Year	c/f Haul seines	c/f Pound nets	c/f Fyke nets	c/f Fish pots	c/f Trot lines
1929	.45	.02	.13	-	-
30	.74	.01	.22	-	-
31	2.32	.02	.32	-	-
32	2.73	.11	.34	-	-
33	1.26	.11	.41	-	-
34	.42	.12	.28	-	1.00
35	.57	.06	.23	.50	-
36	.40	.04	.28	.67	.88
37	.60	.10	.31	.51	1.20
38	.72	.10	.37	.53	.33
39	.66	.08	.30	-	-
40	.72	.07	.29	-	-
41	.75	.08	.29	.08	-
42	.64	.05	.28	.11	3.25
44(2)	.43	.18	.83	.95	1.20
45	1.24	.17	.65	.77	3.50
46	.89	.11	.93	.57	1.46
47	.55	.23	.56	.73	4.00
48	.50	.11	.48	.43	4.00
49	.57	.17	.49	.39	1.70
50	.46	.12	.26	.54	2.58
51	.59	.04	.20	.45	1.84
52	.99	.08	.37	.60	3.03
53	1.29	.31	.87	.31	3.33
54	1.16	.34	1.06	.27	5.63
55	1.07	.31	1.87	.17	4.10
56	.99	.59	1.31	.27	3.87
57	1.38	.25	1.85	.32	2.09
58	1.60	.21	2.05	.20	1.67
59	1.15	.12	1.76	.24	3.83
60	1.44	.23	2.06	.29	3.15
61	1.62	.11	.75	.25	1.01
62	1.11	.24	1.46	.30	1.69
63	.96	.03	.60	.28	2.34
64	1.23	.07	.46	.23	.90
65	.67	.02	.36	.13	.81
66	.62	.12	.71	.12	1.00
67	.73	.02	.60	.11	1.21
68	.83	.01	.72	.05	2.18
69	.89	.03	1.04	.06	2.81
70	.68	.04	1.08	.04	2.95
71	6.40	.04	.40	.08	2.18
72	3.25	.29	.91	.10	1.89
73	4.93	.40	1.51	.10	2.83
74	2.00	.24	3.13	.17	1.19
75	1.54	.27	1.31	.22	1.44
76	.93	.32	.27	.17	.40
77	.66	.95	.28	.24	.59
Average	1.22	.16	.78	.31	2.18

(1) Includes channel catfish, white catfish and bullheads.

(2) 1943 data not available.

WHITE PERCH

Fyke nets, haul seines, and pound nets have been the principal gear for white perch in Virginia, (Table 28). Landings reflected the fluctuations in haul seine c/f closer than fyke net c/f (Fig. 18). The average catch of white perch per year was 660 pounds per haul seine and 220 pounds per fyke net, and 160 pounds per pound net 1929-77.

The falling haul seine c/f 1932-40 reversed itself through the War years and continued gradually upward until 1959. The next six years had decreasing c/f of all gear and landings fell accordingly. White perch populations increased Statewide in 1966 then declined erratically with a pronounced downward trend. The haul seine and fyke net c/f fell together and total landings reflected this decreasing success. By 1973 c/f's were the lowest on record except for pound nets which indicated good populations available to them. The pound net c/f fell off to low values, recovering somewhat by 1977.

The best measure of white perch population size is the combined c/f's of haul seines, fyke nets, and pound nets. Landings have been adequate during some periods to determine trends, but if used alone they would give the impression of larger stocks than actual.

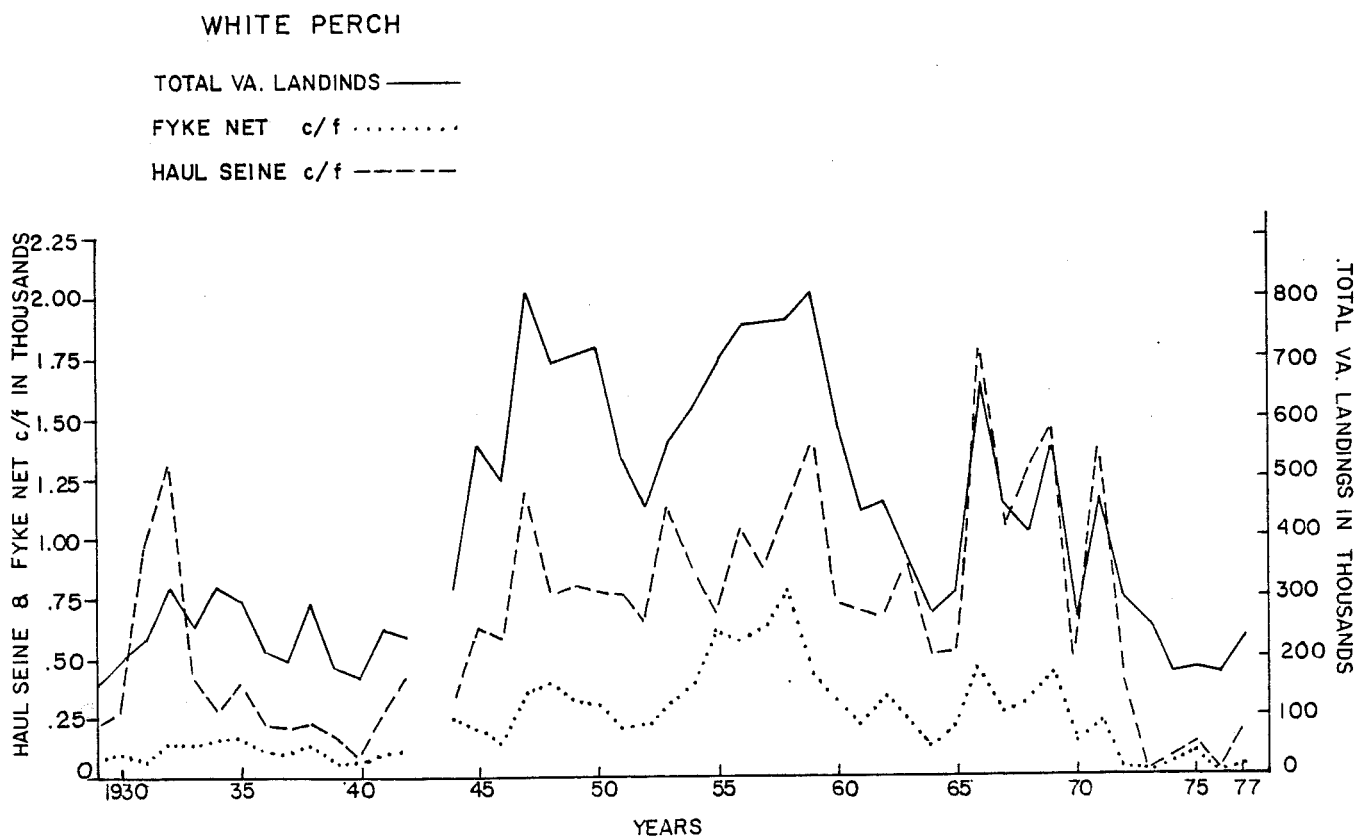


Figure 18. White Perch landings, fyke net c/f for perch, and haul seine c/f for perch.

Table 28. White perch gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20. In thousands of pounds & dollars.

<u>Year</u>	<u>Total catch from pound nets</u>	<u>Total value from pound nets</u>	<u>Total catch from haul seines</u>	<u>Total value from haul seines</u>	<u>Total catch from fyke nets</u>
1929	41	3	45	4	58
30	58	3	53	3	85
31	56	2	125	6	51
32	102	3	117	4	98
33	82	3	81	3	81
34	147	6	49	2	117
35	103	5	59	3	116
36	75	3	38	1	71
37	99	3	28	1	59
38	168	5	33	1	81
39	85	3	26	1	53
40	86	3	12	1	60
41	89	3	34	2	74
42	121	4	46	2	42
44(1)	64	4	118	6	103
45	150	13	222	18	121
46	149	12	246	20	73
47	191	9	321	16	251
48	122	6	240	12	284
49	140	7	252	13	246
50	133	7	254	14	253
51	96	5	214	12	161
52	89	5	142	9	165
53	100	6	212	12	200
54	123	7	162	9	257
55	141	5	144	5	360
56	192	10	191	10	342
57	225	10	172	8	310
58	211	14	208	15	321
59	167	8	313	17	275
60	162	10	151	10	162
61	135	10	120	10	168
62	62	5	110	9	158
63	86	7	123	10	109
64	103	7	86	5	62
65	100	8	82	7	115
66	149	16	281	28	157
67	170	20	145	17	83
68	107	13	168	20	78
69	158	22	196	27	107
70	67	9	75	10	41
71	180	26	126	30	55
72	185	25	37	6	9
73	185	36	1	1	4
74	113	22	6	1	7
75	45	9	15	3	13
76	62	14	4	1	2
77	105	20	15	3	6
Average	120	10	123	9	127

See footnote at end of table.

Table 28 continued. White perch gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

<u>Year</u>	<u>Total value from fyke nets</u>	<u>c/f Pound nets</u>	<u>c/f Haul seines</u>	<u>c/f Fyke nets</u>
1929	5	.02	.23	.06
30	4	.03	.28	.08
31	2	.03	.95	.06
32	4	.05	1.30	.14
33	3	.04	.42	.13
34	4	.08	.27	.16
35	5	.05	.39	.17
36	3	.04	.22	.11
37	2	.06	.20	.08
38	3	.09	.22	.13
39	2	.04	.17	.05
40	2	.05	.09	.07
41	4	.06	.26	.09
42	2	.11	.41	.10
44(1)	5	.05	.33	.22
45	11	.11	.86	.19
46	6	.11	.82	.12
47	15	.14	1.19	.34
48	14	.08	.76	.38
49	13	.11	.79	.32
50	16	.10	.76	.30
51	10	.08	.75	.19
52	9	.10	.64	.21
53	13	.12	1.10	.29
54	15	.16	.85	.38
55	11	.20	.67	.59
56	17	.32	1.04	.56
57	17	.33	.86	.63
58	22	.32	1.12	.75
59	15	.22	1.39	.42
60	10	.21	.72	.30
61	14	.21	.68	.21
62	14	.09	.65	.31
63	9	.12	.88	.23
64	5	.11	.50	.11
65	10	.10	.53	.21
66	16	.15	1.76	.44
67	10	.20	1.02	.26
68	9	.17	1.27	.29
69	15	.22	1.43	.40
70	6	.08	.48	.15
71	13	.54	1.37	.21
72	1	.57	.40	.03
73	1	.54	.02	.03
74	1	.29	.06	.05
75	5	.11	.13	.08
76	1	.17	.03	.02
77	1	.25	.18	.04
Average	8	.16	.66	.22

(1) 1943 data not available.

SPOT

Spot c/f for pound nets and haul seines has had the greatest fluctuation of any species studied here. The fishery since 1929 has been characterized by violent changes in landings and gear success (Fig. 19). This boom or bust nature of the spot fishery can be partially explained by the reliance of the fishery on few year classes in the commercial size range, and by their high reproductive potential. The fishery relies predominately on recruits hatched 2-3 years earlier, thus the unstability is directly related to the fluctuations in year class strength (similar to crabs).

The factors responsible for extreme oscillation in year class strength of spot remain unknown. High stock numbers have led to low landings (and c/f) several years later, and low stock sizes have given rise to good year classes; indicating a direct percent-programing relationship does not exist. Since the cycles are with the peaks and valleys either 2,3,4, or 5 years apart, a predator-prey relationship between parents and progeny is not suspected. Some relationship involving other species may have operated, but our data does not indicate one for the species studied here. The extreme fluctuations may be related in some way to environmental conditions, but we have no data to demonstrate a relationship nor does any casual local factor stand out intuitively.

The average spot c/f for pound nets was 1.2 thousand pounds per year, and 7.4 thousand pounds per haul seine per year for 1929-77. Neither pound nets nor haul seines are set only for spot. Both gears have tracked closely through the years, and except for the pound net c/f 1950-59, either could have been used to measure the relative size of the spot populations. Haul seines would be the preferred single gear.

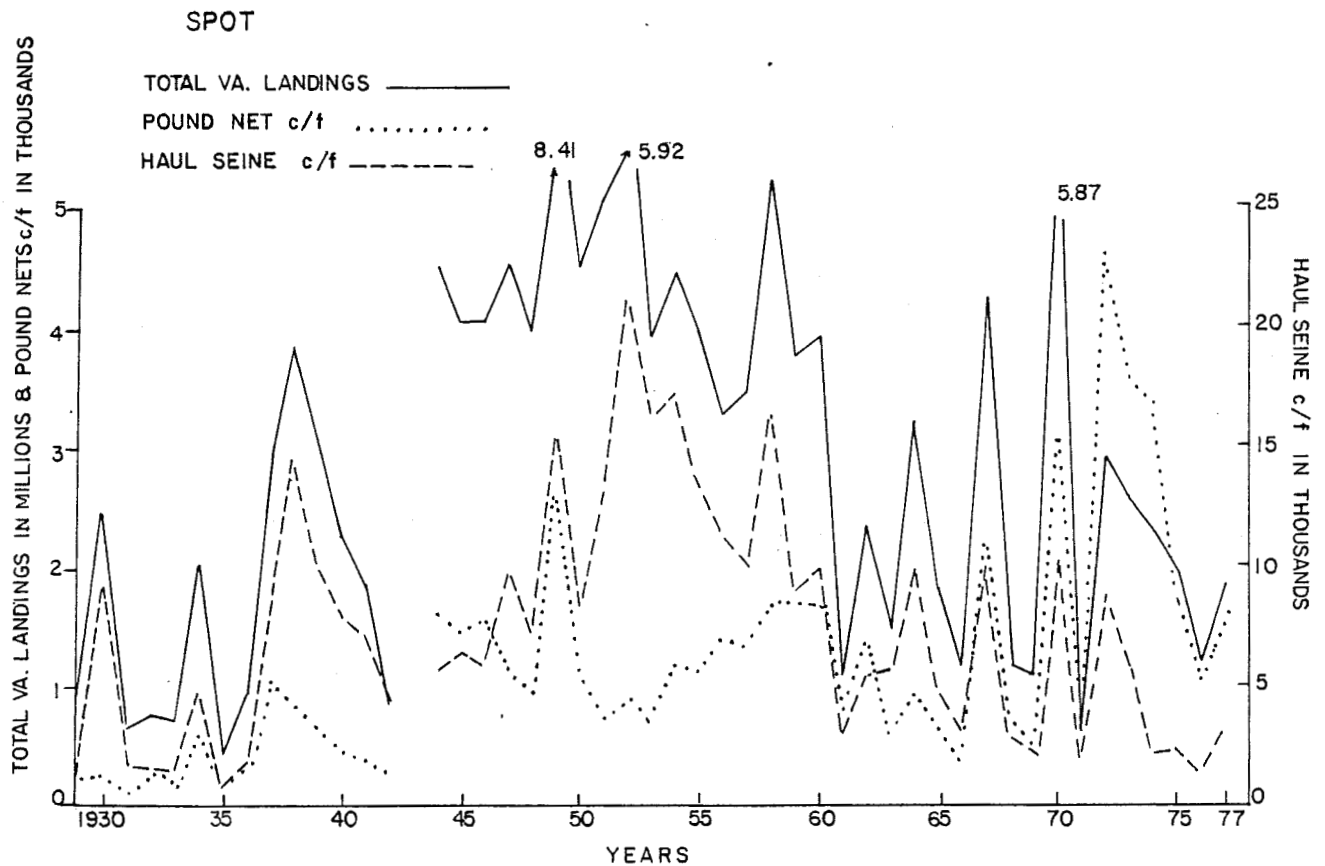


Figure 19. Spot landings, pound net c/f for spot, and haul seine c/f for spot.

Table 29. Spot gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20. In thousands of pounds & dollars.

<u>Year</u>	<u>Total catch from pound nets</u>	<u>Total value from pound nets</u>	<u>Total catch from haul seines</u>	<u>Total value from haul seines</u>
1929	481	24	196	11
30	589	29	1,749	88
31	307	11	233	9
32	607	18	129	4
33	359	10	296	7
34	1,101	32	871	26
35	278	10	111	4
36	644	11	209	4
37	1,702	30	1,180	23
38	1,601	29	2,188	41
39	1,264	25	1,553	30
40	782	15	1,079	26
41	590	18	923	24
42	337	9	484	16
44(1)	2,207	92	2,101	75
45	1,953	176	1,782	160
46	2,035	82	1,726	70
47	1,574	86	2,633	149
48	1,467	84	2,317	135
49	3,247	279	4,847	236
50	1,469	121	2,806	235
51	932	72	3,795	260
52	794	49	4,838	274
53	597	40	3,130	204
54	895	66	3,272	235
55	804	64	2,852	228
56	847	51	2,067	126
57	904	66	2,037	146
58	1,087	67	3,034	193
59	1,279	116	2,033	185
60	1,306	120	2,073	190
61	556	54	467	46
62	913	88	899	84
63	387	65	775	121
64	851	136	1,680	279
65	636	92	762	107
66	346	29	498	49
67	1,819	192	1,423	131
68	466	45	381	37
69	307	39	337	43
70	2,444	230	1,607	142
71	201	23	173	20
72	1,477	167	735	78
73	1,239	155	388	50
74	1,301	199	202	33
75	772	96	268	43
76	409	69	180	31
77	736	146	284	54
Average	1,019	78	1,450	99

See footnote at end of table.

Table 29 continued. Spot gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

Year	Total catch from anchor gill nets	Total value from anchor gill nets	Total catch from otter trawls	Total value from otter trawls
1929	-	-	2	1
30	-	-	55	4
31	-	-	1	1
32	-	-	2	1
33	-	-	27	1
34	-	-	45	1
35	-	-	13	1
36	10	1	20	1
37	18	1	67	1
38	-	-	43	1
39	-	-	199	3
40	-	-	312	5
41	-	-	225	4
42	-	-	39	1
44(1)	-	-	114	4
45	81	7	152	6
46	156	6	118	7
47	143	8	149	9
48	87	5	58	3
49	149	7	13	1
50	102	10	10	1
51	20	1	3	1
52	42	3	4	1
53	17	1	3	1
54	99	7	1	1
55	104	8	9	1
56	49	3	12	1
57	95	7	47	3
58	96	6	70	8
59	165	14	9	1
60	228	25	1	1
61	94	9	1	1
62	234	22	3	1
63	134	23	18	1
64	218	41	7	1
65	131	20	-	-
66	175	17	12	1
67	642	67	-	-
68	148	17	4	1
69	196	28	37	5
70	1,253	125	25	3
71	65	8	3	1
72	604	57	2	1
73	259	39	77	10
74	45	6	70	9
75	15	2	50	6
76	401	83	44	6
77	465	106	18	2
Average	193	23	48	3

See footnote at end of table.

Table 29 continued. Spot gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

<u>Year</u>	<u>c/f Pound nets</u>	<u>c/f Haul seines</u>	<u>c/f Anchor gill nets</u>	<u>c/f Otter trawls</u>
1929	.22	1.00	-	.40
30	.26	9.35	-	4.58
31	.14	1.78	-	.04
32	.30	1.42	-	.07
33	.19	1.55	-	1.00
34	.61	4.76	-	1.80
35	.14	.73	-	.57
36	.34	1.19	5.00	.77
37	1.03	8.49	6.00	3.53
38	.86	14.78	-	1.54
39	.65	10.02	-	7.11
40	.48	7.99	-	13.57
41	.39	7.10	-	10.23
42	.29	4.28	-	2.29
44(1)	1.62	5.80	-	8.14
45	1.47	6.88	.94	4.61
46	1.55	5.75	1.49	4.54
47	1.12	9.75	.82	2.76
48	.99	7.29	.70	1.32
49	2.51	15.24	2.66	.25
50	1.11	8.38	2.08	.19
51	.77	13.22	1.82	.07
52	.85	21.89	3.23	.07
53	.70	16.22	3.40	.05
54	1.15	17.22	1.94	.02
55	1.12	13.33	1.60	.14
56	1.40	11.23	1.40	.20
57	1.32	10.13	1.04	.96
58	1.64	16.40	.87	1.17
59	1.70	9.00	.90	.09
60	1.68	9.92	1.38	.01
61	.87	2.64	.08	.01
62	1.37	5.29	.20	.04
63	.54	5.54	.11	.28
64	.92	9.83	.16	.11
65	.66	4.92	.08	-
66	.35	3.11	.11	.18
67	2.18	10.02	.40	-
68	.73	2.89	.13	.05
69	.43	2.46	.17	.50
70	3.07	10.17	.89	.44
71	.60	1.88	.16	.06
72	4.55	7.90	1.45	.04
73	3.58	5.71	.43	1.40
74	3.37	2.13	.02	1.06
75	1.89	2.39	.02	.60
76	1.09	1.32	.21	.56
77	1.72	3.42	.22	.18
Average	1.18	7.37	1.20	1.69

(1) 1943 data not available.

GREY TROUT (Weakfish)

Pound nets have been the dominant gear for Grey Trout in Virginia, landing an average of 5 million pounds (all units) per year 1929-77 (Table 30). The fishery from 1929-50 had great success and pound net c/f held "steady" for 20 years. The resource declined rapidly after 1947 for unknown reasons, and continued to slide to low levels for the next 20 years (Fig 20). In the early seventies, the grey trout began a comeback which continued through 1977. The pound net c/f in the mid-seventies equalled or exceeded the boom periods of the thirties and forties, but the reduced number of nets kept landings below previous highs.

Otter trawls and haul seines followed the c/f's shown by pound nets through the years with few exceptions. When grey trout are abundant, trawls are capable of having tremendous yearly success. A single trawl can average 100-200 thousand pounds per year, although 50-100 thousand pounds per year also represents excellent fishing.

The fall and rise of the grey trout populations have been very similar to the croaker pattern (compare Fig. 15 and 20). Both species crashed by 1951, rose again by 1955-56, declined to all time lows for many years, then recovered in the early seventies. Young croaker are one of the prime foods of the grey trout, and both have similar migratory habits.

Spot, another prime grey trout food, were abundant during the poor trout years, as were several other species. A direct predatory-prey relationship between croaker and grey trout seems unlikely.

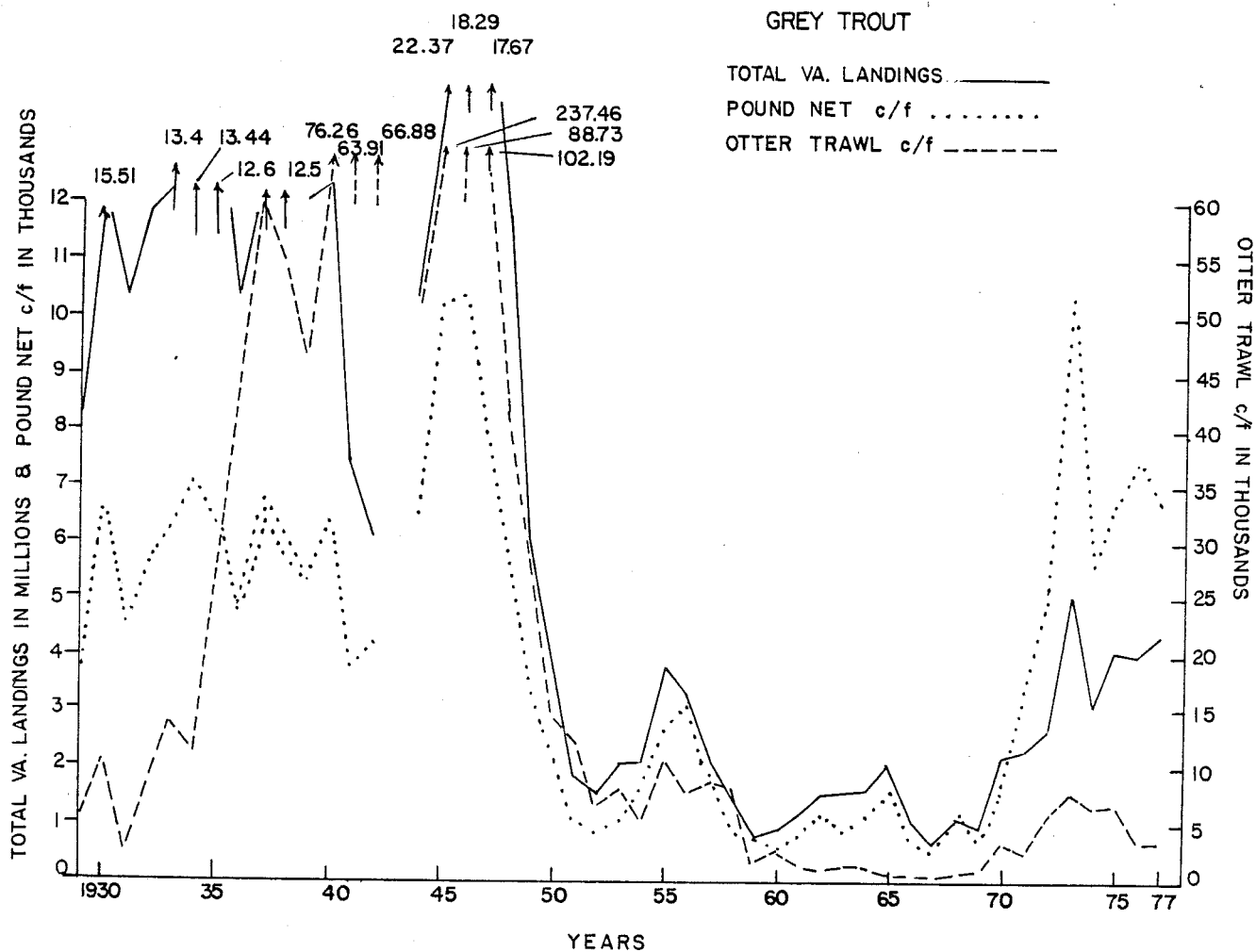


Figure 20. Grey Trout (Weakfish) landings, pound net c/f for trout, and otter trawl c/f for trout.

Table 30. Grey trout gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

<u>Year</u>	<u>Total catch from pound nets</u>	<u>Total value from pound nets</u>	<u>Total catch from haul seines</u>	<u>Total value from haul seines</u>
1929	8,073	321	158	11
30	14,660	529	641	41
31	9,996	283	190	9
32	11,337	268	261	7
33	11,755	212	174	5
34	12,951	239	157	5
35	12,661	141	149	6
36	8,988	153	120	3
37	11,108	196	255	5
38	10,577	170	325	6
39	10,390	163	356	7
40	10,345	167	153	3
41	5,583	113	191	5
42	4,769	97	172	4
44(1)	8,858	335	630	25
45	13,436	1,558	802	88
46	13,449	804	2,165	130
47	11,063	642	923	56
48	9,121	580	852	54
49	4,501	282	592	37
50	2,981	244	219	20
51	1,252	194	214	30
52	774	75	312	32
53	919	95	640	56
54	1,252	134	540	60
55	1,877	125	1,141	89
56	1,919	182	829	78
57	1,165	101	368	34
58	641	46	388	30
59	365	42	154	17
60	377	46	187	24
61	509	73	516	74
62	776	83	457	50
63	606	67	350	39
64	1,041	107	420	42
65	1,566	138	231	21
66	660	60	317	29
67	389	38	155	15
68	736	66	210	22
69	505	53	178	18
70	1,218	141	462	54
71	1,192	141	484	57
72	1,590	170	239	24
73	3,790	471	311	41
74	2,154	333	71	12
75	2,693	341	122	23
76	2,795	440	132	20
77	2,955	468	305	54
Average	5,048	244	400	33

See footnote at end of table.

Table 30 continued. Grey trout gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

Year	Total catch from anchor gill nets	Total value from anchor gill nets	Total catch from otter trawls	Total value from otter trawls
1929	-	-	28	2
30	-	-	126	5
31	-	-	64	2
32	-	-	240	9
33	-	-	364	13
34	-	-	276	8
35	-	-	608	16
36	-	-	1,168	30
37	-	-	1,154	28
38	-	-	1,534	41
39	-	-	1,299	33
40	-	-	1,754	55
41	-	-	1,406	40
42	-	-	1,137	55
44(1)	-	-	718	66
45	199	22	7,836	628
46	174	10	2,307	203
47	74	4	5,518	366
48	32	2	1,807	124
49	10	1	933	73
50	5	1	789	77
51	1	1	509	89
52	1	1	412	48
53	1	1	449	54
54	8	1	297	34
55	45	4	680	55
56	21	2	450	49
57	8	1	454	43
58	3	1	487	43
59	3	1	127	16
60	7	1	227	27
61	6	1	142	20
62	44	5	76	6
63	35	4	84	9
64	1	1	81	6
65	100	11	38	2
66	31	4	20	2
67	31	4	14	1
68	67	7	41	3
69	45	4	65	13
70	137	16	175	24
71	165	20	139	14
72	206	17	267	35
73	106	14	423	64
74	42	8	430	51
75	7	1	576	61
76	258	47	288	33
77	390	72	366	56
Average	69	9	800	57

See footnote at end of table.

Table 30 continued. Grey trout gear statistics for the Virginia commercial fishery 1929-77. One licensed gear equals one unit of yearly effort, gear numbers from Tables 2-20.

<u>Year</u>	<u>c/f Pound nets</u>	<u>c/f Haul seines</u>	<u>c/f Anchor gill nets</u>	<u>c/f Otter trawls</u>
1929	3.69	.81	-	5.60
30	6.48	3.43	-	10.50
31	4.53	1.45	-	2.37
32	5.62	2.87	-	8.89
33	6.25	.91	-	13.48
34	7.16	.86	-	11.04
35	6.33	.98	-	26.44
36	4.73	.68	-	44.92
37	6.71	.84	-	60.74
38	5.65	2.20	-	54.79
39	5.38	2.30	-	46.39
40	6.36	1.13	-	76.26
41	3.69	1.47	-	63.91
42	4.16	1.52	-	66.88
44(1)	6.50	1.74	-	51.29
45	10.09	3.10	2.31	237.46
46	10.26	7.22	1.66	88.73
47	7.90	3.42	.43	102.19
48	6.12	2.68	.26	41.07
49	3.48	1.86	.18	17.94
50	2.25	.65	.10	14.61
51	1.04	.75	.09	12.12
52	.83	1.41	.08	6.87
53	1.07	3.32	.20	8.02
54	1.60	2.84	.16	5.50
55	2.61	5.33	.69	10.63
56	3.18	4.51	.60	7.50
57	1.70	1.83	.09	9.27
58	.97	2.10	.03	8.12
59	.49	.68	.02	1.27
60	.49	.90	.04	2.12
61	.79	2.92	.01	1.63
62	1.17	2.69	.04	.96
63	.85	2.50	.03	1.29
64	1.13	2.46	.001	1.29
65	1.62	1.49	.06	.58
66	.66	1.98	.02	.30
67	.47	1.09	.02	.20
68	1.15	1.59	.06	.51
69	.71	1.30	.04	.88
70	1.53	2.92	.10	3.07
71	3.57	5.26	.40	2.67
72	4.89	2.57	.49	5.45
73	10.95	4.57	.17	7.69
74	5.58	.75	.02	6.52
75	6.60	1.09	.01	6.86
76	7.47	.97	.14	3.65
77	6.89	3.68	.19	3.66
Average	4.03	2.20	.27	24.25

(1) 1943 data not available.

Table 31. Total Virginia landings and value (unadjusted dollars) for ten species 1929-77, in thousands of pounds and dollars. Data from U.S. Fishery Digest, NMFS.

Year	American Shad		Blue Crab(1)		Catfish & Bullhead		Croaker	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
1929	7,977	1,379	32,078	668	247	13	14,414	349
30	6,183	989	31,821	738	408	15	19,908	463
31	7,291	864	30,676	491	610	25	12,398	243
32	4,847	424	28,573	383	696	21	14,693	252
33	4,817	440	25,979	427	718	22	14,235	187
34	4,104	315	23,886	560	510	21	19,943	234
35	2,883	275	21,212	644	482	16	23,038	293
36	1,615	179	28,107	792	430	14	28,442	299
37	3,086	273	30,403	790	607	21	33,112	498
38	3,608	333	31,473	697	664	26	43,285	559
39	3,559	329	29,750	660	584	27	41,056	608
40	2,811	317	24,994	638	472	20	38,292	560
41	2,125	198	17,426	674	496	23	28,435	605
42	2,430	217	20,089	669	308	18	26,694	586
44(2)	4,665	554	26,351	1,919	1,786	159	33,229	1,732
45	5,300	971	20,652	1,761	1,961	175	55,194	6,014
46	3,599	630	28,507	2,236	1,645	132	37,321	3,732
47	4,086	718	36,776	2,333	1,948	156	39,061	3,791
48	3,206	533	45,464	2,944	1,437	101	23,152	2,688
49	2,800	417	43,163	2,673	1,447	100	12,381	1,837
50	3,032	499	49,626	2,333	1,429	128	6,674	1,210
51	3,294	581	41,579	2,238	1,197	91	4,223	656
52	4,007	609	35,745	1,702	1,438	87	3,641	425
53	3,054	523	34,910	2,008	1,851	134	4,061	403
54	3,169	586	34,561	1,638	2,323	169	5,124	508
55	3,500	595	28,695	1,751	2,749	165	9,752	798
56	3,191	451	27,561	2,083	2,645	159	9,668	801
57	2,918	486	26,513	2,077	2,758	216	14,198	1,541
58	2,254	405	19,102	1,292	2,684	224	11,856	1,092
59	1,774	307	22,389	1,887	3,080	203	7,655	1,215
60	1,349	234	40,860	2,444	2,992	198	3,933	643
61	1,329	222	45,544	2,367	2,469	164	3,082	565
62	2,220	312	55,018	2,952	2,432	162	1,294	294
63	2,312	347	47,087	2,875	1,754	116	122	31
64	2,651	326	52,570	3,837	1,460	101	394	63
65	2,955	307	51,642	4,169	940	91	1,532	154
66	2,431	219	64,759	4,016	1,151	143	1,463	194
67	2,138	181	56,041	3,406	939	125	324	57
68	2,550	161	45,647	5,260	1,068	153	6	1
69	2,248	166	35,671	3,965	1,354	178	63	10
70	4,112	315	43,326	2,726	1,135	171	128	15
71	1,520	135	48,500	4,022	1,373	201	265	33
72	2,057	225	49,412	4,335	1,503	225	484	68
73	2,436	366	37,729	4,560	1,226	226	1,358	160
74	1,569	230	41,663	4,656	1,475	305	1,502	205
75	1,137	308	35,573	5,401	1,522	328	4,721	513
76	862	283	26,311	5,615	1,009	220	5,864	785
77	1,469	498	37,872	7,162	1,617	342	8,599	921
Average	3,095	422	35,693	2,406	1,396	128	13,964	810

See footnotes at end of table.

Table 31 continued. Total Virginia landings and value (unadjusted dollars) for ten species 1929-77, in thousands of pounds and dollars. Data from U.S. Fishery Digest, NMFS.

Year	Grey Trout		Hard Clam		Oyster		Spot	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
1929	8,392	346	912	337	16,767	2,070	872	46
30	15,512	581	1,213	392	19,618	2,282	2,493	125
31	10,279	295	742	253	15,936	1,310	637	23
32	11,974	287	1,484	348	14,904	1,074	753	22
33	12,310	231	1,169	264	13,468	937	717	18
34	13,406	253	2,609	364	21,869	1,400	2,041	59
35	13,443	164	1,644	371	14,317	998	407	14
36	10,349	189	2,625	407	14,254	1,207	910	17
37	12,607	233	1,631	271	10,986	781	2,979	55
38	12,547	226	2,810	375	14,049	1,172	3,866	72
39	12,099	206	2,025	338	16,504	1,336	3,060	58
40	12,306	229	1,764	352	17,714	1,573	2,212	46
41	7,232	160	1,563	339	16,622	2,142	1,818	49
42	6,126	158	1,672	554	14,954	2,701	901	28
44(2)	10,313	431	834	378	15,720	4,529	4,533	175
45	22,379	2,308	1,010	526	17,536	6,359	4,031	355
46	18,291	1,159	979	667	19,765	5,905	4,097	167
47	17,678	1,075	879	439	20,654	7,465	4,529	254
48	11,854	764	1,567	783	21,118	7,025	3,958	228
49	6,062	395	1,497	641	18,059	5,988	8,411	529
50	4,011	344	1,379	689	15,548	5,574	4,498	377
51	1,979	314	1,267	626	15,076	5,277	5,031	354
52	1,509	157	1,128	673	18,130	7,712	5,916	338
53	2,032	207	873	484	19,512	7,652	3,913	256
54	2,122	231	729	389	21,225	9,840	4,432	321
55	3,831	280	887	489	21,955	10,016	3,949	316
56	3,258	317	796	441	21,221	9,900	3,208	195
57	2,019	182	725	434	20,090	9,847	3,471	251
58	1,567	124	711	426	25,504	14,127	5,256	358
59	682	79	1,690	832	21,356	13,374	3,755	340
60	810	99	1,661	756	15,340	10,884	3,906	362
61	1,194	171	1,861	865	17,163	13,931	1,184	115
62	1,489	159	1,690	812	11,800	9,774	2,350	224
63	1,098	122	2,096	1,012	10,518	8,110	1,475	236
64	1,593	161	2,453	1,219	14,150	10,345	3,198	530
65	2,007	180	2,487	1,337	12,568	10,291	1,751	248
66	1,040	96	1,860	1,010	9,443	6,494	1,153	107
67	600	59	1,860	1,047	9,068	5,959	4,253	426
68	1,120	102	1,869	1,055	7,805	5,269	1,116	111
69	870	96	1,903	1,200	8,312	4,986	1,049	139
70	2,142	253	1,331	872	8,043	5,427	5,873	547
71	2,332	270	1,837	1,398	8,442	5,510	504	58
72	2,616	285	1,338	1,130	5,014	3,241	2,951	322
73	5,099	673	1,354	1,258	4,980	3,179	2,576	361
74	3,063	467	1,419	1,329	6,738	4,844	2,251	349
75	4,090	554	1,088	1,022	6,237	4,999	1,918	276
76	3,975	622	900	860	5,799	5,633	1,192	224
77	4,289	716	1,060	1,348	4,962	5,554	1,868	388
Average	6,408	354	1,476	696	14,600	5,750	2,859	218

See footnotes at end of table.

Table 31 continued. Total Virginia landings and value (unadjusted dollars) for ten species 1929-77, in thousands of pounds and dollars. Data from U.S. Fishery Digest, NMFS.

Year	Striped Bass		White Perch		All species total	
	Pounds	Value	Pounds	Value	Pounds	Value
1929	290	55	151	14	211,286	7,286
30	425	67	196	10	245,294	7,487
31	481	62	235	11	226,637	4,722
32	594	71	318	12	297,381	3,965
33	519	63	247	10	217,018	3,327
34	310	29	315	13	246,801	4,177
35	375	39	294	12	217,592	3,521
36	520	35	210	8	270,304	4,312
37	1,005	63	195	5	242,292	3,829
38	1,155	91	290	9	237,331	4,403
39	964	79	179	6	262,272	4,604
40	659	64	166	6	269,651	4,858
41	865	78	244	10	280,680	5,742
42	778	71	232	9	155,454	5,972
44(2)	1,864	227	317	17	215,828	12,446
45	2,119	339	546	44	252,787	21,518
46	2,084	313	488	39	299,836	18,562
47	1,725	329	812	42	348,303	20,198
48	2,452	333	690	34	310,123	19,384
49	1,913	234	700	37	275,675	16,598
50	2,796	370	718	40	313,799	16,119
51	1,804	276	533	31	265,888	14,965
52	1,242	192	448	26	219,472	16,005
53	803	121	559	33	277,825	15,995
54	951	146	616	35	412,541	19,991
55	894	177	685	23	440,959	20,454
56	995	161	757	38	314,352	19,271
57	929	149	759	38	380,138	20,256
58	1,317	211	782	54	437,146	24,746
59	2,097	330	828	44	526,306	25,750
60	2,278	316	570	37	366,684	20,925
61	1,854	290	433	35	411,414	24,315
62	1,944	279	450	39	453,901	21,701
63	2,747	356	342	28	374,746	19,056
64	1,889	301	270	19	465,768	24,219
65	2,213	433	309	27	504,862	26,969
66	2,803	526	642	65	418,380	20,959
67	1,677	260	445	53	347,651	18,093
68	1,614	293	400	48	382,820	20,576
69	2,671	517	551	77	280,077	17,926
70	1,782	371	264	35	531,868	21,585
71	1,221	288	461	63	491,765	21,821
72	2,659	569	293	40	666,180	26,824
73	2,888	769	251	51	630,744	40,857
74	2,564	613	170	34	530,409	35,667
75	1,331	642	182	39	444,827	33,076
76	928	477	167	41	528,366	43,834
77	830	447	225	44	609,105	55,867
Average	1,476	261	415	31	356,470	18,015

(1) Hard and soft crabs combined.

(2) 1943 data not available.