VII.—REPORT OF OPERATIONS AT THE NORTHVILLE AND ALPENA (MICH.) STATIONS FOR THE SEASON OF 1885-'86.

By Frank N. Clark.

The work, on the whole, shows a satisfactory increase in results over the preceding year, though there is a slight falling off in the brook-trout and rainbow-trout branches of the service.

The receipts of whitefish eggs at both stations amounted to 168,000,000, an increase of 13,000,000 over last year. Most of this supply was drawn from the usual sources, namely, the island region of Lake Erie, the penning station at Monroe, and the west shore of Lake Huron. About 20,000,000 were secured from new territory along the north shore of Lake Michigan, from the spawning runs to the reefs fished from Thompson, Mich. These runs occur in November and December, the late runs to the gill-net grounds beginning as a rule several days after the collection of spawn has been discontinued at other points. Eggs were taken here as late as December 16, and even then the fish were spawning freely; but fishing was discontinued on that date.

The shipments of whitefish eggs foot up 42,800,000, an increase of 11,800,000. The extent to which the shipping of eggs is now carried adds not a little to the winter work. In every instance the eggs were carefully hand-picked, and the strictest attention was given to all the numerous details involved in preparing, packing, and forwarding.

The number of whitefish eggs hatched at both stations, for distribution to the waters of the Great Lakes, was 92,000,000, an increase of 4,000,000. The increase in the number actually planted was, however, much greater than is shown by the latter figures, owing to the slight losses in transit, as compared with last year. The car work was highly successful, due chiefly to the employment of two cars, instead of one, as heretofore; by which additional service the accumulation and exhaustion of young fish in the tanks was prevented, the fry being disposed of while in a vigorous condition.

The whitefish eggs were carried forward in creek water, which is several degrees colder than spring water, until about six weeks prior to the hatching period. From that time forward nearly one-half the eggs were transferred at intervals to spring water, thus preventing, to a

certain extent, a precipitation of the entire hatch, which would overtax the storage and shipping facilities.

The lake-trout work was more than three times that of any preceding year. The number of eggs received was 1,475,000; from which number, 1,031,000 were shipped and 115,500 fish hatched; of the latter, 75,500 were distributed and 40,000 retained at the station.

Heretofore the supply of lake-trout eggs was drawn from the big reef of central Lake Huron, but as the fishing was very light on these grounds the past season, new territory was worked with much better success than formerly. Most of the supply was obtained from the fisheries operated from Thompson, Mich., on the north shore of Lake Michigan. This is one of the best points on the lakes for securing the spawn of this species. The spawning season begins in the last week of October and continues nearly a month. The other source of supply was the island shoals of Thunder Bay and vicinity. The runs occur very early here, beginning about September 25 and ending about October 10. The Thompson eggs were received at Northville in good condition, being forwarded in cool weather by regular line of steamers to Saint Ignace, thence transferred to regular lines for Detroit, where they were met by messenger. The Thunder Bay eggs arrived at Northville in fair condition, though not so good as those from Lake Michigan, the weather at this time being some warmer. The water was also warm and the eggs advanced rapidly, those retained at the Northville Station hatching in December.

The number of brook-trout eggs taken at Northville was 225,000, but these were not of the best quality, and a considerable percentage died soon after being placed in the hatching boxes. One hundred and seventy thousand eggs were shipped, of which 25,000 were exchanged for an equal number from the Paris Station of the Michigan commission. The latter were hatched and most of them retained at Northville for the purpose of introducing new stock and crossing with the old, the vigor and vitality of which have become impaired through a long term of interbreeding.

Additional new stock, in the form of wild trout, was placed in the Northville ponds in the month of June. These fish, 305 in number, chiefly yearlings and two-year-olds, were taken from Deer Creek and Boyne River, Charlevoix County, Michigan.

The rainbow-trout work was much less satisfactory than that with the brook trout; 167,000 eggs were taken, from which number, 5,000 were shipped and 30,000 fry hatched, while the remainder of the eggs died in the hatching boxes.

On account of the continued partial failure in the returns from this species, I would recommend that the stock on hand be distributed, and their propagation at the Northville Station be discontinued. At present about one-half of the water supply and pond facilities is devoted to rainbow trout, the returns from which are meager and unsatisfactory.

By supplanting them with brook trout and German trout, or by concentrating the divided forces on one line, the aggregate results would be greatly increased.

A few of the German trout, from stock raised from eggs received at Northville in the spring of 1883, spawned last December. In all, 8,000 eggs of prime quality were taken. In addition, two consignments of these eggs were received from Fred Mather. The first lot, 10,000 in number, arrived on March 25, in good condition; the second lot, 13,000 in number, on April 23, in very poor condition, about one-half having hatched *en route*. The stock fish of this species in the Northville ponds show a better and more uniform growth than our brook trout, and promise exceedingly well.

A case of 29,000 eggs of landlocked salmon was transferred from Grand Lake Stream, Maine, arriving on March 19 in fine condition. The hatching percentage was very good, but there was considerable loss on fry. Total number of fry distributed, 22,000.

The distribution of stock fish from the ponds of the Northville Station was successfully carried on during the past spring, chiefly by car No. 2, the remainder by special messengers. The fish thus disposed of were yearling and two-year-old brook and rainbow trout. The number disbursed to each applicant or locality was small as compared with the usual assignments of fry, but the relative importance of the distribution should not on this account be underestimated. The measure of results, I am thoroughly satisfied, will be a hundred-fold greater. Time will prove—if, indeed, it has not already done so—the wisdom of the plan of using fish not less than a year old for stocking new waters.

During the fall and winter 4,000 carp from the national ponds at Washington were forwarded, on orders, to applicants; also 85 goldfish.

A few thousand eggs of German whitefish, and about the same number of smelt, were forwarded to Northville by Fred Mather last spring, but they were in very poor condition and few hatched. The final results were purely negative, as the young fish soon died.

Two new ponds, each 10 by 40 feet, were added to the plant of the Northville Station during the first two months of the fiscal year, and two others were subdivided into sections, thus affording more perfect isolation of the various sizes and varieties in stock.

WHITEFISH.

In submitting this report of the operations in the whitefish department I am gratified to announce that the past season has been abundantly fruitful of good results in the three important divisions into which successful propagation naturally divides itself, namely, first, collection of spawn; second, hatching of same; third, distribution of fry.

During the months of November and December upwards of 100,000,000 whitefish eggs were received at Northville Hatchery and 68,000,000

at Alpena Hatchery, a satisfactory increase over the work of last season. The eggs shipped to Northville were taken principally from the island region of western Lake Erie, and at Monroe, Mich., from penned fish. Later in the season, however, 16,000,000 of the eggs taken in at Alpena were repacked and shipped to Northville, as better facilities for shipping are obtainable at the latter place. The first eggs were received from the spawning beds of Lake Erie on November 11, and the last on December 7. The general plan of operations in the manipulation of spawn and the treatment of fry varies so little from preceding years that it is unnecessary to dwell at length upon this department of the industry. Eggs commenced hatching at Northville on March 7 and ended on April 20, thus showing an average period of incubation of one hundred and twenty-five days. The temperature of water varied from 32° to 43° Fahr., averaging 34¼°. The water used for whitefish eggs at Northville was pumped from a small river near the hatchery; that used at Alpena was drawn from Thunder Bay. The hatching season at Alpena was about a month later than at Northville. The period of spawning in the waters of Lakes Huron and Michigan varies considerably from that of Erie, but the great bulk of eggs are taken at the same time, consequently the busy season at Alpena commences about the same time as at Northville. There are several localities in the waters of Lakes Huron and Michigan where eggs are taken for Alpena Station, but at least 75 per cent are and obtained at Miller's Point and Alcona, in Lake Huron, and Epoufette and Thompson, in Lake Michigan.

The season's shipments of eggs were made principally during the months of December and January, as shown in the following tables, to several States and Territories, the District of Columbia, England, Germany, Switzerland, and New Zealand by way of California, this last covering a distance of nearly half around the globe.

BROOK TROUT.

The brook-trout work this season may be considered fairly successful, although it would scarcely be a favorable comparison with that of the past few seasons. In all, 225,000 eggs were obtained; from which number, 145,000 eggs were shipped, and 25,000 fry hatched, 4,000 of which were shipped during April and May, as follows:

W. S. Woodward, Plymouth, Ind	1,000
J. S. Little, Niles, Mich	1,000
Rev. Father Maher, Notre Dame, Ind	1,000
C. H. Bates, Lake Station, Mich., for F. and P. M. R. R	1,000

The remaining fry have been kept to replenish ponds from which yearlings and two-year-olds have been distributed. The first eggs were taken from a two-year-old on October 16. The fish continued to spawn till December 31, on which date 400 eggs were taken from a two-year-old, which closed the spawning season.

Fifty-five thousand five hundred eggs were taken from 272 spawners one year old, an average of 204 from each; 79,400 eggs from 269 spawners two years old, an average of 295; 90,100 from 137 spawners three years old, an average of 657. On December 31, 25,000 eggs were shipped to W. D. Marks, superintendent Michigan commission, Paris, Mich., in exchange for an equal number of same species which were hatched at Northville Station and mostly retained for breeding purposes. In connection with this may be mentioned the taking of 305 yearling and two-year-old wild trout in the month of June from the streams of Northern Michigan and successful shipment of same to the Northville Station.

The following table shows the date, number of eggs taken from females of different ages, and number of males used:

ONE YEAR OLD.

Date.	Male.	Female.	No. of eggs.	Date.	Male.	Female.	No. of eggs.	Date.	Male.	Female.	No. of eggs.
1885.				1885.				1885.			
Oct. 22	4	1	200	Nov. 4	12	12	2,200	Nov. 15	9	9	1,700
27	12	8	2,000	5	21	21	4,000	20	13	13	2,000
28	13	9	2,000	6	20	18	3,600	25	7	6	1,200
29	13	14	2,400	7	6	6	1,400	30	4	4	1,000
30	20	20	3,800	9	13	13	2,500	Dec. 10	3	3	800
31	18	18	3,700	10	18	18	4,400			272	55,500
Nov. 1	8	5	1,900	11	10	11	2,300				
2	11	11	2,800	12	2	2	600				
3	24	24	4,200	13	26	26	4,800				

TWO YEARS OLD.

Date.	Male.	Female.	No. of eggs.	Date.	Male.	Female.	No. of eggs.	Date.	Male.	Female.	No. of eggs.
1885.				1885.				1885.			
Oct. 16	1	1	800	Nov. 4	4	4	900	Nov. 19	16	18	5,400
20	1	1	600	5	7	6	1,500	20	18	18	4,800
21	2	1	400	6	4	4	1,400	21	19	19	5,000
24	2	1	200	7	10	9	3,200	22	1	1	400
25	5	4	800	8	3	2	700	23	1	1	200
26	1	1	200	9	19	17	5,600	24	19	19	7,200
27	6	4	500	10	12	11	3,000	25	5	5	1,400
28	3	2	600	11	15	15	4,600	26	6	6	1,600
29	3	3	800	12	14	14	3,500	27	1	1	400
30	2	1	400	13	13	13	3,200	Dec. 18	9	9	3,500
31	1	1	300	15	5	5	1,400	31	1	1	400
Nov. 1	2	2	800	16	15	15	4,600			269	79,400
2	5	5	1,200	17	13	13	3,200				
3	4	4	1,600	18	12	12	3,100				

THREE YEARS OLD.

Date.	Male.	Female.	No. of eggs.	Date.	Male.	Female.	No. of eggs.	Date.	Male.	Female.	No. of eggs.
1885.				1885.				1885.			
Oct. 17	1	1	1,500	Nov. 1	6	6	5,000	Nov. 16	1	1	300
18	1	1	1,500	2	4	4	3,400	18	4	4	1,600
19	2	1	1,400	3	5	3	2,600	20	14	14	6,400
20	2	2	2,000	4	5	4	4,800	21	6	6	3,800
21	3	2	1,700	5	4	4	2,400	23	1	1	600
22	4	1	800	6	7	7	4,000	24	1	1	800
24	2	1	1,600	7	9	9	5,800	26	2	2	1,600
25	2	1	600	8	5	4	3,400	28	1	1	400
26	5	8	2,200	9	7	6	2,800	Dec. 4	2	2	1,200
27	8	7	2,800	10	4	4	2,200	7	1	1	800
28	5	4	3,200	11	7	7	4,200	11	1	1	1,600
29	3	2	1,200	12	7	7	3,200			137	90,100
30	3	3	2,000	13	4	4	2,000				
31	2	3	2,200	15	2	2	1,000				

Total, 225,000.

RAINBOW TROUT.

The following table shows the dates of spawning, and number of fish spawned and eggs taken:

Date.	Male.	Female.	No. of eggs.	Date.	Male.	Female.	No. of eggs.	Date.	Male.	Female.	No. of eggs.
1885.				1886.				1886.			
Dec. 29	1	1	900	Feb. 17	2	2	1,000	Mar. 22	4	4	1,500
1886.				18	2	3	3,000	23	7	7	3,000
Jan. 1	1	1	900	20	1	1	400	24	4	4	1,200
3	3	2	2,000	21	2	2	1,200	25	3	3	1,200
5	1	1	600	22	6	6	3,400	26	9	9	4,000
6	1	1	700	23	8	8	3,300	27	6	6	2,000
8	1	1	300	24	10	10	5,400	28	2	2	300
11	1	1	200	25	3	3	400	29	5	5	2,100
12	3	3	1,600	26	2	2	700	30	6	6	2,300
13	3	2	800	27	3	3	1,800	31	7	7	3,000
14	2	1	600	Mar. 28	2	2	700	Apr. 1	3	3	1,200
15	1	2	1,200	1	2	2	1,200	2	5	5	2,100
16	2	2	1,800	2	3	3	1,300	3	3	3	1,000
17	1	1	800	3	5	5	2,200	5	2	2	700
20	4	4	3,000	4	5	5	2,800	8	2	2	600
27	6	5	3,400	5	11	11	3,900	9	9	10	3,300
28	2	2	1,000	6	14	14	5,600	10	5	5	1,600
30	1	2	1,800	7	3	3	1,200	11	2	2	700
31	1	2	800	8	11	11	5,300	13	3	3	900
Feb. 1	1	1	600	9	8	8	3,200	14	6	6	2,700
4	1	1	400	10	16	16	6,700	15	3	3	1,100
5	2	2	1,000	11	8	8	2,800	16	4	4	1,800
7	1	1	300	12	17	17	5,400	17	6	6	1,700
8	3	4	3,200	13	5	5	2,200	18	2	2	600
9	2	2	1,100	14	5	5	1,900	20	2	2	600
10	3	3	1,400	15	6	6	2,500	21	2	2	600
11	7	9	5,300	16	3	3	900	22	2	2	400
12	2	1	800	17	12	12	5,200	23	3	3	800
13	2	1	800	18	5	5	1,800	24	1	1	200
14	3	3	1,800	19	3	3	1,500	25	1	1	200
15	2	2	1,200	20	2	2	1,000				
16	1	1	300	21	6	6	2,500	Total	375	377	167,000

The eggs turned out very poorly, only 35,000 being saved, of which 3,000 were shipped to B. F. Ferris, Castalia, Ohio, and 2,000 to S. B. Smith, Zanesville, Ohio. The remaining 30,000 hatched; but a large percentage of the young fish died within six weeks, despite the greatest care and attention. Not more than 5,000 survived the critical period of trout raising, namely, the first three weeks after the absorption of the food-sac. The continued meager returns from this variety of trout scarcely justifies a continuance of this branch of the service at the Northville Station. It would seem that the species will not acclimatize to the waters of this station, notwithstanding the special effort that has been made for a number of years to bring about this result. The waters are well adapted to brook trout, and it would seem to be a wise policy to displace the rainbow trout by the brook trout as soon as possible.

LAKE TROUT.

The season's work in this species has been unprecedented in the history of the hatchery, having received nearly one and one-half million of eggs from the spawning grounds of Lake Huron, in the vicinity of Alpena

on Thunder Bay, and Epoufette and Thompson on Lake Michigan. The eggs were taken by Superintendent S. P. Wires and assistants, of the Alpena Hatchery, all of whom have had several seasons' experience in spawn gathering, thus insuring care in the collection and forwarding.

The first eggs were taken about the first of October, the fish continuing to spawn into November. During the latter part of October and the first part of November the eggs were shipped by boat to Detroit, thence by rail to Northville, with scarcely any loss in transit of the many shipments, showing good work on the part of packers and dispatch by carriers. The season was not marked by any noteworthy changes in the methods of hatching, having failed by various experiments in finding one more satisfactory or successful than that used in preceding years. During the winter and spring 1,031,000 eggs and 75,500 fry were shipped to various points in this and foreign countries, and 40,000 fry were retained at the hatchery, making a total of 1,146,500 eggs and fry successfully handled.

More eggs were taken at Thompson, Mich., on the north shore of Lake Michigan, than at any other point, although this was the first attempt in that region. E. A. Tulian, who had charge of the collection in that section, writes as follows: "The first trout eggs were taken at Thompson on October 31. The fish had then just commenced to spawn. At this time only the small trout on the inside grounds were spawning. The large trout on the outside grounds commenced spawning November 10, and were still spawning freely when the work closed on November 21. We collected during this time nine cases of eggs, all taken from fish caught by two tugs."

LANDLOCKED SALMON.

On March 19 a case containing 29,000 eggs of this species was received at this station from Charles G. Atkins, of Grand Lake Stream, Maine. Only 100 dead eggs were picked out when unpacked, having come this long distance in exceptionally fine condition. They were immediately transferred to the hatching boxes, in which they remained till after hatching. April 8 they commenced to hatch, and were all through by the 14th. From the time of transfer to hatching boxes till all were hatched only 475 dead eggs were taken out. The fry were transferred from boxes to nursery tanks into water varying in temperature from 38° to 50°. On April 27th 10,000 fry were shipped in U. S. Fish Commission car No. 2, to the township of Hayes, Clare County, Mich., and planted in a small lake, the headwaters of Cedar River, with only a nominal loss in shipment. The 12,000 fry delivered to Mr. Eli Tinlin, agent of the Michigan Fish Commission, on May 15, were planted the day following in Rapid River, tributary to Torch Lake, Kalkaska and Antrim Counties, Michigan.

THE BROWN, EUROPEAN, OR GERMAN TROUT.

A few of the German trout reared at the Northville Station spawned in December, and about 8,000 eggs of very good quality were obtained. Two cases of eggs of the same species were forwarded to Northville by Fred Mather. The first lot, consisting of 10,000, came in good condition; the second lot, 13,000 in number, arrived in very poor condition, being too far advanced when shipped. The total results from the above amounted to 20,000 fry, which were retained at the station.

Temperature of river water used at Northville Station for incubating whitefish eggs, from November 25, 1885, to April 15, 1886.

Date.	8 a. m.	12 m.	5 p. m.	Date.	8 a. m.	12 m.	5 p. m.	Date.	8 a. m.	12 m.	5 p. m.
	°	°	°		°	°	°		°	°	°
Nov. 25..	36	36	36	Jan. 12..	32	32	32	Mar. 1..	32	32	32
26..	36	36	36	13..	32	32	32	2..	32	32	32
27..	36	36	36	14..	32	32	32	3..	32	32	33
28..	36	36	36	15..	32	32	32	4..	32	34	38
29..	35	35	35	16..	33	33	33	5..	32	35	39
30..	35	35	35	17..	32	32	32	6..	32	34	41
Dec. 1..	35	35	34	18..	32	32	32	7..	32	33	38
2..	34	34	34	19..	32	33	32	8..	33	37	38
3..	34	34	33	20..	32	32	32	9..	33	34	35
4..	33	33	33	21..	32	32	32	10..	32	38	40
5..	33	33	33	22..	32	32	32	11..	32	39	40
6..	32	32	32	23..	32	32	32	12..	34	35	40
7..	32	32	32	24..	32	32	32	13..	34	36	40
8..	32	32	32	25..	32	32	32	14..	33	36	39
9..	32	32	32	26..	32	33	32	15..	33	36	39
10..	32	32	32	27..	33	33	34	16..	33	35	37
11..	32	32	32	28..	33	34	64	17..	33	34	38
12..	32	32	32	29..	33	33	34	18..	34	35	38
13..	32	32	32	30..	32	33	33	19..	34	38	41
14..	32	32	32	31..	32	32	32	20..	36	39	40
15..	32	32	32	Feb. 1..	32	32	32	21..	34	35	35
16..	32	32	32	2..	32	32	32	22..	32	33	33
17..	32	32	33	3..	32	32	32	23..	32	34	38
18..	33	35	38	4..	32	32	32	24..	33	36	41
19..	32	34	33	5..	32	32	32	25..	37	38	43
20..	32	32	32	6..	32	32	32	26..	42	43	43
21..	32	36	35	7..	32	32	32	27..	37	37	41
22..	32	34	34	8..	32	33	33	28..	32	34	43
23..	34	34	34	9..	32	34	36	29..	34	39	43
24..	32	32	33	10..	33	35	36	30..	39	40	42
25..	32	32	32	11..	34	36	36	31..	38	38	41
26..	32	32	32	12..	32	33	32	Apr. 1..	36	36	35
27..	32	32	33	13..	32	32	32	2..	33	36	38
28..	33	35	34	14..	32	32	32	3..	32	35	42
29..	34	35	35	15..	32	32	32	4..	34	38	41
30..	36	37	37	16..	32	32	32	5..	34	39	40
31..	37	37	36	17..	32	32	32	6..	35	33	32
Jan. 1..	35	36	38	18..	32	32	34	7..	33	33	33
2..	34	35	37	19..	32	33	32	8..	32	34	36
3..	38	38	40	20	32	32	32	9..	32	35	37
4..	42	42	42	21..	32	32	32	10..	34	36	38
5..	34	34	34	22..	32	32	32	11..	37	40	44
6..	32	32	32	23..	32	33	33	12..	44	45	47
7..	32	32	32	24..	32	34	38	13..	49	48	48
8..	32	32	32	25..	35	33	32	14..	51	49	52
9..	32	32	32	26..	32	32	32	15..	55	52	52
10..	32	32	32	27..	32	32	32				
11..	32	32	32	28..	32	32	32				

Temperature of spring water used at Northville Station for incubating trout eggs, from November 25, 1885, to April 15, 1886.

Date.	8 a. m.	12 m.	5 p. m.	Date.	8 a. m.	12 m.	5 p. m.	Date.	8 a. m.	12 m.	5 p. m.
	°	°	°		°	°	°		°	°	°
Nov. 25	40	40	40	Jan. 12	39	39	40	Mar. 1	39	42	42
26	40	40	40	13	39	40	40	2	39	41	42
27	41	41	41	14	39	41	40	3	39	43	44
28	39	40	40	15	40	41	41	4	42	45	47
29	39	39	40	16	42	42	41	5	44	47	49
30	38	39	39	17	38	39	39	6	44	47	50
Dec. 1	38	39	39	18	40	41	41	7	46	50	50
2	38	38	38	19	41	40	40	8	46	48	49
3	37	38	38	20	39	40	40	9	44	45	45
4	37	37	37	21	39	39	42	10	42	47	47
5	36	37	36	22	39	40	40	11	43	46	47
6	36	36	36	23	37	39	40	12	44	47	48
7	36	37	38	24	39	40	42	13	45	46	48
8	38	38	40	25	40	41	42	14	44	48	49
9	39	41	40	26	42	43	43	15	43	46	49
10	39	40	39	27	42	44	43	16	45	48	48
11	38	39	39	28	42	42	43	17	46	46	48
12	39	40	38	29	42	42	43	18	46	47	48
13	40	40	40	30	40	41	42	19	46	48	51
14	39	39	39	31	38	39	39	20	48	51	51
15	38	39	39	Feb. 1	39	40	40	21	46	47	46
16	40	41	42	2	38	36	36	22	43	45	44
17	42	43	43	3	38	38	38	23	41	46	46
18	44	45	43	4	38	40	40	24	44	49	50
19	41	42	43	5	39	39	39	25	40	48	49
20	39	41	40	6	39	40	41	26	45	51	51
21	41	44	41	7	41	43	44	27	46	47	48
22	47	47	44	8	42	45	45	28	43	44	48
23	47	48	47	9	42	46	47	29	44	48	49
24	44	44	47	10	45	46	48	30	46	49	49
25	42	42	42	11	46	49	49	31	46	47	48
26	40	41	40	12	47	47	47	Apr. 1	46	46	47
27	40	41	41	13	47	47	46	2	42	46	44
28	42	45	44	14	45	45	44	3	41	47	48
29	44	45	45	15	43	44	43	4	43	48	48
30	46	46	46	16	36	37	38	5	43	48	48
31	46	46	46	17	39	43	42	6	40	36	36
Jan. 1	45	45	45	18	40	44	46	7	37	40	44
2	44	44	45	19	45	45	44	8	42	46	50
3	46	47	48	20	34	36	38	9	46	49	51
4	49	50	49	21	36	37	37	10	49	51	51
5	44	44	44	22	38	40	40	11	49	50	51
6	36	37	38	23	42	44	45	12	49	51	53
7	39	40	40	24	41	45	48	13	50	52	53
8	39	39	39	25	46	45	42	14	49	55	58
9	38	38	38	26	36	38	39	15	52	55	56
10	38	38	38	27	39	42	43				
11	38	38	38	28	30	42	42				

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