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NESTING OF THE RING-NECKED PHEASANT ON PELEE ISLAND, ONTARIO [1]

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TEN THOUSAND ACRE Pelee Island, in western Lake Erie, is noted for its high population of pheasants (Clarke and Braffette 1946, Stokes 1948, Ball 1950).

Nesting studies were carried on during 1947 and 1948. Acknowledgement of aid is gratefully made to the Department of Lands and Forests of Ontario for making this study possible.

Weather

For the spring months for the period 1935 to 1946 the average rainfall was 13.3 inches. The average spring rain for 30 years was 11.1; the average for 1934 to 1939 was 12.4; and the average for 1940 to 1946 was 14.1.

During April there was only one storm in the ten years 1937-1947 with over four inches of rainfall in 24 hours accompanied by a high wind. Before 1939 the rainfall was slight for several years, but during the best years for pheasants it was still above normal.

The 1948 spring was not as wet as the 1947 spring, and consequently not as many pheasant nests were under water. Mr. E. Behn, who spoke of seeing 6 or 7 nests along one of his fence rows "drowned out" in 1947, went along the same row in 1948 and none of the nests were under water. However, there were some nests under very wet conditions along the ditches in 1948. Most of these were early nests. Three such nests were observed May 18, 1948, along one road. All had large clutches (i.e., 27, 36, 19).

Non-hayfield nests

Pelee Island pheasant nests were constructed essentially as described by Hamerstrom (1936). They usually consisted of a scooped out depression lined with near-by weed stems. The lining of the nest increased as the number of eggs increased.

The early nests were along the dykes and ditches, and on the edges of wood lots. Later, as alfalfa and hay fields provided sufficient cover, nests were found there.

Eggs dropped at random were common during the early part of the spring in both years. Laying eggs at random and deserting one or two nests is thought to be typical behavior of the wild hen (Buss, Meyer and Kabat, 1951).

Table 1 shows the nesting cover for 42 nests (excluding hayfield nests) observed in 1947.

Table 1

Type cover	Number of nests	Number of successful nests
1. grass	19	4
2. hedgerow	12	4
3. wood and brushpile	5	3
4. weeds (mostly *Solidago* sp.)	5	2
5. alfalfa	1	1

Nests in woods and brushpiles were most easily found because of the contrasting color of the eggs. The number of available sites of this kind was limited in comparison to the other nesting cover. If hens flushed from grass or weeds their nests were relatively easy to locate, but if they did not, very difficult. Contrary to Leffingwell's (1926) findings, but similar to Buss's (1946), whether or not the hen flushed seemed to depend on the individual bird rather than on the

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stage of incubation. Some birds could be stroked on the nest while others flushed at (for example) 15 feet, yet both had been incubating some time.

Some birds would be less than six inches from my foot yet not flush. Finding the nests of these inconspicuous birds often depended on the hen's making some small movement such as blinking an eye. C. Hoare, a farmer, reported stepping on a hen sitting on her nest and hearing the eggs break under her.

There were several interesting nest sites chosen; one hen nested at the foot of a large elm tree, with not a weed or stem of grass near it, and right beside a cow track. Every time the cows were driven past in the evening the bird would flush, and every time return. This pheasant was said to have hatched eight eggs successfully, gone off with the brood, then later returned and hatched the remaining five.

Two nests were among the bushes of a well cultivated raspberry patch. One of these was successful. Another barren location was a roll of wire in the middle of a pasture.

One nest was located at the foot of a tombstone. The grass was kept mowed around it but the nest was successful.

Forty-two non-hayfield nests were found in 1947. Of these 33⅓ per cent definitely hatched some of the eggs. In 1948, 251 nests were located or reliably reported. Of these 74 hatched some eggs, 156 definitely had no hatch and 21 were doubtful. This is a nesting success of 29.5 per cent (see figure 1.). If hens normally lay eggs in two nests before they start laying and incubating eggs in a third nest (Buss, Meyer and Kabat, 1951) two-thirds of these nests would not have been successful. In such a case this would have produced the very successful nesting season which the subsequent open season proved it had been.

In four nests of the 74 it was not possible to tell the number of eggs hatched, although some had. In the 70 remaining nests 777 eggs were laid, giving an average clutch of 11.2. There was an average hatch of 8.3 eggs. In 1947 the non-hayfield nests produced a higher number of eggs laid (11.5) and a lower average hatch (7.6).

Many early pheasant nests are unsuccessful, but this is not necessarily detrimental to the fall population as Errington and Hamerstrom (1937), and Buss, Meyer and Kabat (1951) have pointed out. About 80 per cent of the hens will bring off broods later. Similarly Stoddard (1931) found that 60 per cent to 80 per cent of bob-white quail first nesting attempts were unsuccessful, yet few pairs were completely unsuccessful in bringing off young. This is corroborated by the work of Meyer, Kabat and Buss (1947) with ovulated follicles.

The hatching date of 50 non-hayfield nests in 1948 is known. Twenty hatched between June first and June fifteenth, 16 between June fifteenth and June thirtieth, 13 between July first and July fifteenth, and one between July sixteenth and July thirtieth. This corresponds with the hatching dates determined by summer brood observations by Buss, Meyer and Kabat (1951).

The highest nesting density I found was in an alfalfa field. This two and one-half acre field contained 20 nests, a density of eight nests to the acre.

The nesting density during the peak pheasant years on Pelee Island is illustrated by Clarke and Braffette (1946):

> "Mr. Wiebe has a garden of a few square rods and an orchard of a few trees under which the ground is kept bare by barnyard fowl, and there are a few hands-breadth of weeds along the fence. Real cover is completely lacking and the whole area on which the house stands along with fowl pens, drive sheds and other buildings, does not exceed half an acre. Mr. Wiebe found eleven nests around his house in one season, yet in other areas one would never expect a nest in such a situation."

One nest in 1948 was situated somewhat similarly to those Mr. Wiebe mentions. It was in a rock garden right against the farmhouse. The owner weeded the rock garden but left the weeds right around the pheasant's nest. It was later deserted.

During the spring and summer of 1948 I made an intensive study of one weed field of about 27 acres. One hundred and four nests were located in this field. The field consisted mainly of goldenrod (*Solidago* sp.), common ragweed (*Ambrosia elatior*), giant ragweed (*Ambrosia trifida*) and nettle

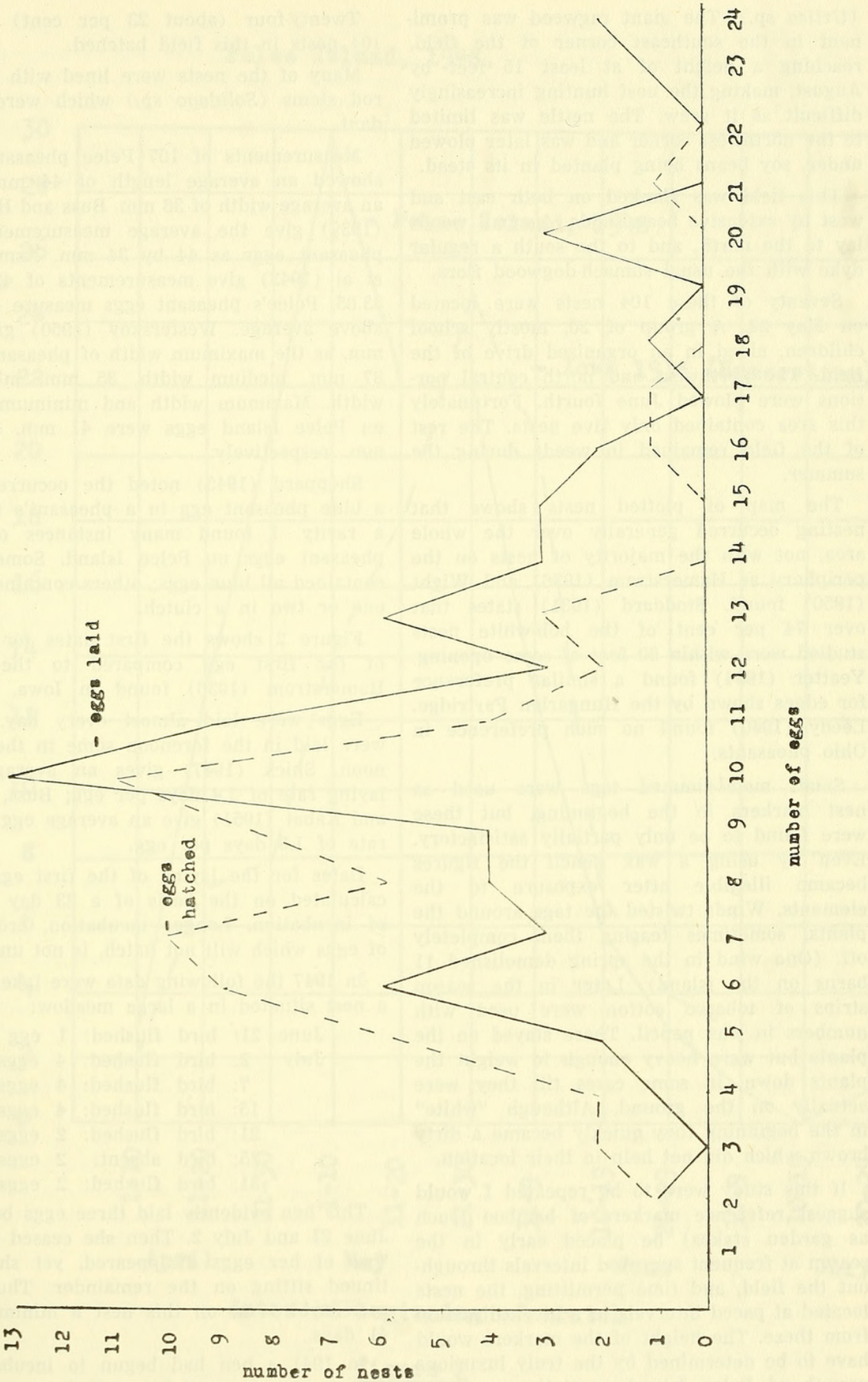
- eggs laid
- eggs hatched
number of eggs
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
number of nests
0 1 2 3 4 5 6 7 8 9 10 11 12 13

figure 1.

(*Urtica* sp.). The giant ragweed was prominent in the southeast corner of the field, reaching a height of at least 15 feet by August, making the nest hunting increasingly difficult as it grew. The nettle was limited to the northwest corner and was later plowed under, soy beans being planted in its stead.

This field was flanked on both east and west by extensive bean fields. A small woods lay to the north, and to the south a regular dyke with the usual sumach-dogwood flora.

Seventy of these 104 nests were located on May 22. A group of 20, mostly school children, aided in an organized drive of the field. The northwest and north central portions were plowed June fourth. Fortunately this area contained only five nests. The rest of the field remained in weeds during the summer.

The map of plotted nests shows that nesting occurred generally over the whole area, not with the majority of nests on the periphery as Hamerstrom (1936) and Wight (1950) found. Stoddard (1931) states that over 74 per cent of the bob-white nests studied were within 50 feet of some opening. Yeatter (1934) found a similar preference for edges shown by the Hungarian Partridge. Leedy (1940) found no such preference in Ohio pheasants.

Small metal-rimmed tags were used as nest markers in the beginning, but these were found to be only partially satisfactory. Even by using a wax pencil the figures became illegible after exposure to the elements. Winds twisted the tags around the plants, sometimes tearing them completely off. (One wind in the spring demolished 11 barns on the island). Later in the season strips of tobacco cotton were used with numbers in wax pencil. These stayed on the plants but were heavy enough to weight the plants down, in some cases till they were actually on the ground. Although "white" in the beginning they quickly became a dirty brown which did not help in their location.

If this study were to be repeated I would suggest reference markers of bamboo (such as garden stakes) be placed early in the season at frequent surveyed intervals throughout the field, and time permitting, the nests located at paced intervals in a given direction from these. The height of the markers would have to be determined by the truly luxurious growth of Pelee Island vegetation.

Twenty-four (about 23 per cent) of the 104 nests in this field hatched.

Many of the nests were lined with goldenrod stems (*Solidago* sp.) which were abundant.

Measurements of 107 Pelee pheasant eggs showed an average length of 44 mm., and an average width of 36 mm. Buss and Hawkins (1939) give the average measurements for pheasant eggs as 44 by 34 mm. Asmundson et al (1943) give measurements of 42.77 by 33.65. Pelee's pheasant eggs measure slightly above average. Westerskov (1950) gives 39 mm. as the maximum width of pheasant eggs, 37 mm. medium width, 35 mm. minimum width. Maximum width and minimum width on Pelee Island eggs were 41 mm. and 33 mm. respectively.

Sheppard (1945) noted the occurrence of a blue pheasant egg in a pheasant's nest as a rarity. I found many instances of blue pheasant eggs on Pelee Island. Some nests contained all blue eggs; others contained only one or two in a clutch.

Figure 2 shows the first dates for laying of the first egg compared to the dates Hamerstrom (1936) found in Iowa.

Eggs were laid almost every day. Some were laid in the forenoon some in the afternoon. Shick (1947) gives an average egg laying rate of 1.4 days per egg; Buss, Meyer and Kabat (1951) give an average egg laying rate of 1.3 days per egg.

Dates for the laying of the first egg were calculated on the basis of a 23 day period of incubation. Longer incubation, ordinarily of eggs which will not hatch, is not unusual.

In 1947 the following data were taken from a nest situated in a large meadow:

June	21:	bird flushed:	1	egg
July	2:	bird flushed:	4	eggs
	7:	bird flushed:	4	eggs
	15:	bird flushed:	4	eggs
	21:	bird flushed:	2	eggs
	25:	bird absent:	2	eggs
	31:	bird flushed:	2	eggs

This hen evidently laid three eggs between June 21 and July 2. Then she ceased laying. Two of her eggs disappeared, yet she continued sitting on the remainder. Thus this patient bird sat on this nest a minimum of 41 days.

In 1941 a hen had begun to incubate on July 5 when a small boy pulled out some of

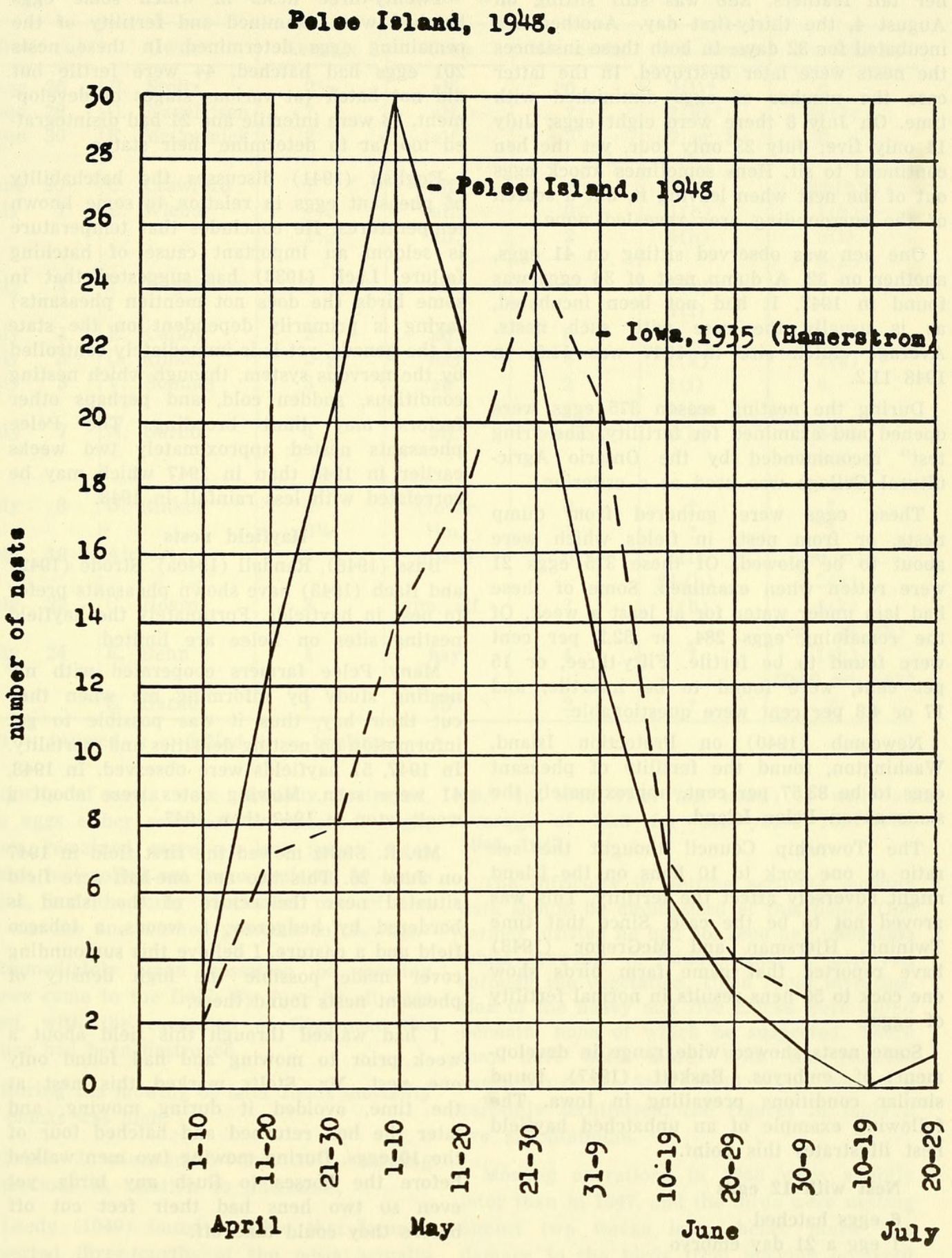
Pelee Island, 1948.
- Pelee Island, 1948
- Iowa, 1935 (Hamerstrom)
number of nests
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
1-10
11-20
21-30
1-10
11-20
21-30
31-9
10-19
20-29
30-9
10-19
20-29
April
May
June
July
dates of beginning of clutch

figure 2

her tail feathers. She was still sitting on August 4, the thirty-first day. Another hen incubated for 32 days. In both these instances the nests were later destroyed. In the latter case the number of eggs diminished with time. On July 8 there were eight eggs; July 14 only five; July 23 only four, yet the hen continued to sit. Hens sometimes knock eggs out of the nest when leaving it, but a search of the surrounding area revealed none.

One hen was observed sitting on 41 eggs, another on 32. A dump nest of 36 eggs was found in 1947. It had not been incubated, as is usually the case with such nests. Average clutch size in 1947 was 11.5, in 1948 11.2.

During the nesting season 375 eggs were opened and examined for fertility. The "ring test" recommended by the Ontario Agricultural College was used as a criterion.

These eggs were gathered from dump nests, or from nests in fields which were about to be plowed. Of these 375 eggs 21 were rotten when examined. Some of these had lain under water for at least a week. Of the remaining eggs 284, or 82.2 per cent were found to be fertile. Fifty-three, or 15 per cent, were found to be infertile, and 17 or 4.8 per cent were questionable.

Newcomb (1940) on Protection Island, Washington, found the fertility of pheasant eggs to be 83.57 per cent, approximately the same as on Pelee Island.

The Township Council thought the sex ratio of one cock to 10 hens on the island might adversely affect the fertility. This was proved not to be the case. Since that time Twining, Hjersman and McGregor (1948) have reported that game farm birds show one cock to 50 hens results in normal fertility of eggs.

Some nests showed wide range in development of embryos. Baskett (1947) found similar conditions prevailing in Iowa. The following example of an unhatched hayfield nest illustrates this point.

Nest with 12 eggs

6 eggs hatched
1 egg a 21 day embryo
1 egg a 20 day embryo
1 egg an 18 day embryo
1 egg a 5 day embryo
1 egg a 2 day embryo
1 egg infertile

Twenty-three nests in which some eggs hatched were examined and fertility of the remaining eggs determined. In these nests 201 eggs had hatched, 44 were fertile but did not hatch (at various stages of development, 33 were infertile and 21 had disintegrated too far to determine their status.

English (1941) discusses the hatchability of pheasant eggs in relation to some known temperatures. He concludes that temperature is seldom an important cause of hatching failure. Lack (1933) has suggested that in some birds (he does not mention pheasants) laying is primarily dependent on the state of the gonads, yet it is immediately controlled by the nervous system, through which nesting conditions, sudden cold, and perhaps other factors may limit breeding. The Pelee pheasants nested approximately two weeks earlier in 1948 than in 1947 which may be correlated with less rainfall in 1948.

Hayfield nests

Buss (1946), Randall (1940a), Strode (1942) and Bach (1943) have shown pheasants prefer to nest in hayfields. Fortunately the hayfield nesting sites on Pelee are limited.

Many Pelee farmers cooperated with my nesting study by informing me when they cut their hay, thus it was possible to get information on nesting densities and mortality. In 1947, 51 hayfields were observed. In 1948, 41 were seen. Mowing dates were about a week later in 1948 than 1947.

Mr. R. Stoltz mowed the first field in 1947 on June 26. This two and one-half acre field situated near the centre of the island is bordered by hedgerow, a woods, a tobacco field and a pasture. I believe this surrounding cover made possible the high density of pheasant nests found there.

I had walked through this field about a week prior to mowing and had found only one nest. Mr. Stoltz marked this nest at the time, avoided it during mowing, and later the hen returned and hatched four of the 10 eggs. During mowing two men walked before the horses to flush any birds, yet even so two hens had their feet cut off before they could take off.

The inadequacy of one person nest hunting in such a field was shown by the discovery of 20 nests during mowing; one was revealed nearly every round. No young were seen though three of the nests had hatched. The

Table 2

Date cut	Owner	Acreage	Crop	No. nests	No. hens	No. chicks
June 26	R. Stoltz	2½	alf.	20	2(i)*	0
June 28	G. Nageleisen	?	alf.	?	2(h)*	40(?)
June 30	E. McCormick	2	alf.	2	7 or 8 (h)	0
June 30	C. Crawford	1	alf.	6 or 7	3(h)	20-(h?)
July 1	E. Wiebe	¼	alf.	0	1(h)	1(k)*
		1½	alf.	2	4(h)	8(i)
						0(h)
July 1	P. Nageleisen	2	alf.	2	1(k)	0
					1(i)	
July 1	E. Callow	2	alf.	0	0	0
July 3	D. Rinkel	2½	hay	4	1(k)	1(k)
July 3	V. Solman	3	alf.	2	1(i)	0
					1(h)	
July 7	N. Garno	4	alf.	several?	4(h)	4(k)
						1(i)
						1(h)
July 8	D. Rinkel	4	clover	6-	?	?
		3½	tim.	1	?	?
July 16	Airport	20	mixed	0	1(i)	50-(h)
					24-(h)	2(k)
July 22	C. Hoare	3	tim. alf.	?	1(h)	4(k)
						est. 20 (k)
July 24	E. Behn	1	hay	4	?	1(k)
						50-60 est. (h?)
?	E. Garno	1	alf.	2	?	?

* i = injured, k = killed, h = healthy.

majority of nests were virtually destroyed, the eggs either scattered or smashed. Eight nests remained more or less intact. Eggs which had rolled out were replaced in these eight, but the only successful one of the 20 was the one marked previous to mowing.

Immediately upon cessation of mowing crows came to the field. By June 30 all eggs seen, with the exception of five near the house had been destroyed.

During the mowing of later fields mortality of chicks was high.

Table 2 summarizes the 1947 mowing operations in relation to pheasants.

Leedy (1949) found in Ohio that farmers reported three-fourths of the nests actually present in hay they cut in pre-war years... when tractors were not used as much as they are today. In alfalfa he reported 11.6 pheasant nests per hundred acres in 1947, 29.5 in 1946 (for 702 nests)... with an average of 30.3 for the years 1937-1940, 1946, 1947.

The difficulty in getting accurate mowing data should be emphasized at this point. One farmer insisted he had not seen any pheasants while mowing. A minute later a hen ran through the vegetation. Upon rapid investigation of the heavy mat five chicks were found beneath, none of which he suspected. There may have been more. With the possible exception of the Stoltz field, which was very carefully scrutinized, the figures in table 2 are all minimum.

Mowing operations in 1948 were slightly later than in 1947, and the birds were nesting almost two weeks later, hence much less damage to the birds from mowing occurred in 1948. Again many farmers cooperated by letting us know their mowing dates. Table 3 gives the results of the hayfield nesting data, 1948.

Egg losses

Egg losses on Pelee Island are in four categories: dropped eggs, desertion, predation, nesting parasitism.

Some hunters board their dogs at Pelee farm houses all year in order to have them available during the open season. These dogs cause desertion. I saw three examples of their killing nesting hens. Others were reported. There were 168 licensed dogs on the island in 1947. The town clerk estimated more than half of these were hunting dogs.

A municipal ordinance to keep hunting dogs tied during pheasant nesting season was of questionable effectiveness. Four mornings in April I observed two hunting dogs working the hedgerows, one on either side, as they are taught to do during the hunt.

One farmer reported waking at 1 a.m. to the sound of dogs in his yard. Before he could get out three of his chickens were dead.

Another farmer reported seeing a pack of seven dogs in his field one morning. He emptied both barrels of his shotgun into the pack, killing five and injuring one. Such drastic methods should cut down pheasant predation from this source.

The subject of predation on Pelee is a controversial one. It certainly cannot be claimed to be a predator-free area. As the nesting losses are about the same as in other areas the so-called "lack" of predators on Pelee cannot be the reason for the high pheasant population.

Aside from human beings the birds suffer considerable losses from feral cats and wandering dogs, and many exposed eggs are destroyed by crows in the spring.

Migrating hawks and fox snakes take very few eggs, and loss through them is negligible, though it is interesting to note that there were three substantiated cases of "wompers" (*Elaphe vulpina*) taking pheasant eggs in the 1948 nesting season. Hardy (1951) reports ruffed grouse nest predation by black snakes in Kentucky.

Road kills are another decimating factor. Scott (1938) in Iowa calculated an annual kill of 2.2265 birds on each mile of improved highway in pheasant range. There are approximately 60 miles of roads on Pelee Island, but only about 20 miles of highway. This would make an annual kill of about 44 birds based on Scott's figures.

Most ground-nesting birds suffer heavy nesting losses. The pheasant is no exception. In many cases of deserted nests the cause of desertion is unknown.

The disappearance of eggs is another problem. The snakes certainly take some, but they seem to stay at the nest till they have swallowed all the eggs. I suspect that the rats may be the predators but have no proof. Chipmunks do not occur on the island. McCabe and Hawkins (1946) found fox squirrels would not take Hungarian partridge eggs.

Most of the crow damage is a result of the exposure of eggs by mowing. Grackles abound, but I did not observe any egg predation by them. Several grackles were walking in the rock garden which contained the pheasant's nest, but they did not touch the eggs.

The feral cats are one of the worst Pelee predators. One farmer declared that with a dog in winter you could find six or seven of these cats hunting along the ditches. I observed several instances of mother cats feeding their kittens young pheasants daily.

I watched a Cooper's Hawk fly over a field containing at least 50 feeding pheasants. The hawk made a few darts at the birds but did not come close enough to get one. There were two nests of this species on the island.

A Marsh Hawk fed on a pheasant in the nesting-study field. Randall (1940b) found that ring-necked pheasants in Pennsylvania constituted 1.1 per cent of the food taken by Marsh Hawks. He concluded that the effect of Marsh Hawks upon the pheasant population was negligible. English (1933) found three pheasant bands in Marsh Hawk pellets. He also found that winter mortality was largely due to Great Horned Owls and Cooper's Hawks. There were no Great Horned Owls on Pelee Island.

Parasitism

Pheasant nesting parasitism has been discussed by Bennett (1936). He found ducks', rails', and European Partridges' nests parasitized by pheasants. Clarke (1939) found

Table 3

Incubated	Deserted	No. eggs	Hatched	Hatching date
X	X	11	—	—
X	X	6	—	—
X	—	7	5	June 23
X	—	11	11	prior June 29
X	—	13	—	pipped June 29
X	—	10	10	approx. June 26
X	—	9	9	approx. June 19
X	—	10	8	June 26
X	X	10	—	—
X	X	8	—	—
X	X	10	—	—
X	—	6	4	approx. June 5
X	X	10	—	—
—	X	12	—	—
X	—	8	8	June 29
—	X	14	—	—
—	X	12	—	—
—	X	7	—	—
X	X	11	—	—
X	—	10	9	July 1
X	X	9	—	—
X	—	10	7	July 2
—	X	2	—	—
—	X	9	9	—
—	X	5	—	—
X	X	8	—	—
X	X	9	—	—
—	X	18	—	—
X	—	16	10	approx. June 23
—	X	11	—	—
X	—	9	6	approx. July 7
X	—	10	9	July 3
—	X	3	—	—
X	—	13	13	July 1
X	—	12	10	July 10
X	X	6	—	—
X	X	8	—	—
X	—	10	10	July 1
X	—	8	7	July 2
X	—	7	5	approx. July 2
X	—	4	4	Approx. June 24

X — incubated, deserted re column
— not incubated, not deserted re column

pheasant eggs in a Ruffed Grouse nest. Knott, Ball and Yocom (1943) found seven of the 113 Hungarian Partridge nests they studied parasitized by pheasants.

I observed pheasant eggs in duck, chicken, and guinea hen nests on Pelee Island. I observed only one mixed brood, however, a guinea hen with four or five small guinea hens and three pheasant chicks. Eight out of 34 nests observed on Old Hen Island had chicken eggs. None of these hatched. It was later reported that three pheasant hens there had adopted broods of chickens.

Hatching

The hatching process takes about 12 hours. For about an hour or two after hatching the young remain in the nest, drying off. They then leave the nest and do not return.

A combination of hatched hayfield nests and non-hayfield nests showed the 1948 dates of hatching as follows:

June 1 — June 15 ... 21 nests hatched
June 16 — June 30... 23 nests hatched
July 1 — July 15 ... 22 nests hatched
July 16 — July 30 ... 1 nest hatched

Stokes aged broods on Pelee Island by measurements of primary wing feathers and foot lengths using the tables worked out by Trautman (1948) and by the wing molt method as described by Buss (1946). The hatching dates as derived by these methods corresponded closely with the hatching dates derived from my nesting study.

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FRASER'S OBSERVATIONS OF SCREECH OWLS AT A NEST-BOX[1]

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DURING THE WINTER of 1947-48, a screech owl roosted in a bird-box on a gable of the home of W. J. Fraser, of Toronto, Ontario. In the spring of 1948, a second owl appeared, and a pair nested in the box.

The bird-box was not more than 15 feet from a bay window on the south side of the second floor. From this window, Fraser watched the owls, and made notes on their activities from February 16 to May 16. These notes were not made with the intention of publishing them. However, since they include some details of the nest life of this species prior to the hatching of the eggs, the author has secured permission from Mr. Fraser to summarize them and publish the summary.

Due to a serious illness of his wife, Fraser was in a position to spend long periods observing the owls at all hours of the day and night. Binoculars and flashlight were employed on occasion, and one glass pane of the bay window was replaced with "Vitaglass," permitting the calls of the birds to be heard easily in the room. The roof of the bird-box was hinged, and by walking out on the verandah roof, Fraser made inspections of the box interior at irregular intervals.

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SUMMARY OF FRASER'S DIARY

February 16.	Diary began.
March 26.	Two owls instead of one around the box for the first time.
April 1 and 3.	Owls observed copulating at about 20 minutes after sunset on the bough of a nearby tree. Male (?), with wings working, on top of female.
May 3.	Part of one egg seen protruding from under sitting bird.

[1] Received for publication September 17, 1951.