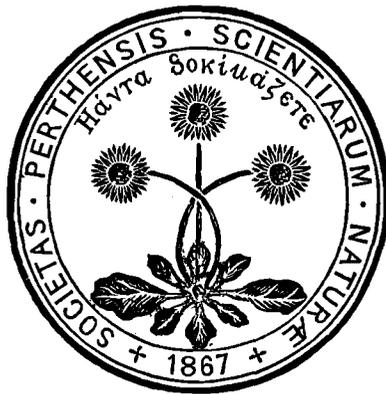


TRANSACTIONS
AND
PROCEEDINGS
OF THE
PERTHSHIRE SOCIETY
of NATURAL SCIENCE

for the years 1965-68



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SCIENCE

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Editorial

The editorial is the one space in any journal where we, the editor, can give expression to our own peculiar notions about a Society such as ours and its function in society with a small "s". There is no requirement for the membership to be wholly in agreement with such ideas but, of course, we would welcome your approval.

It seems to us pertinent that, in a non-university city, our Society of Natural Science does supply a special theatre of activity which no other body can or does. We provide a series of lectures of high quality every winter, which, open to the public, stimulates interest and may generate enthusiasms among people of all age groups. Arrangements are made for sections, which, actively pursuing their specialised fields of study, offer excursions, projects and lectures all the year round. Joining one of these, a dilettante can become a student and a student an authority.

It is almost three years since the publication of the previous volume of Transactions and Proceedings, a circumstance which causes us considerable regret, and makes us wish to do better in future. The obstacles are purely financial ones, increased printing costs rendering it difficult to prepare a journal in no way inferior

to those produced by the Society during its formative years. But the need for regularly published Transactions is perfectly plain to us. We consider that this volume is a record of the findings of advanced scholarship. We see it as a vehicle for the dissemination of local knowledge to a wider circle of friends than can possibly occupy the seats in the lecture hall of the Museum. An honest re-appraisal of the value of work of this nature is now due by members and non-members alike. Fortunately, there are signs that the Society's place in the cultural and educational scene is beginning to be recognised.

We owe our grateful acknowledgement to the four contributors to this volume, all members and experts in their chosen fields, who between them have assisted us in placing in your hands a remarkable range of fact and figure which adds to the store of knowledge relating to our own region of Perthshire. Finally, although we have been unable to find room for a full account of the Proceedings of the Society over the last three years, it is hoped that this deficiency will be made up in subsequent issues. However, a report on the activities and engagements in connection with centenary year, 1967, will be found at the end of the volume.

A. W. Robson.

PERTH, January, 1969.

Wintering Duck in Perthshire, 1957-67

Valerie M. Thom

Introduction

Until comparatively recently, little detailed information has been available on the numbers and distribution of wintering duck in Britain. The older County faunas referred vaguely to a species as "common" or "rare," and it was not until the appearance of the Nature Conservancy Monograph *Wildfowl in Great Britain* that detailed figures were published in support of these statements. Pressure of space restricted the regional descriptions given in the Monograph, and the purpose here is to fill in some of the details for Perthshire and provide a basis for judging population changes in the future. It should be emphasised, however, that the information on wintering duck is by no means complete and that much remains to be learned. A survey of summer distribution is at present in progress and will form the basis for a complementary paper on the breeding ducks of Perthshire.

The information given is based on data obtained through the National Wildfowl Count organisation. Some information has been recorded for over 60 different areas in Perthshire, representing both highland and lowland waters. These areas are listed in the Appendix, together with an indication of the adequacy of cover.

Frequent reference is made to five earlier works. To avoid tedious repetition of dates, etc., in the text, details of these publications are summarised here and later reference is to the author only. *A Fauna of the Tay Basin and Strathmore* by J. A. Harvie-Brown was published in 1906, and quotes records over the previous 100 years. More attention is paid to breeding than to wintering distribution and the indications of status, which are given in very general terms, and are somewhat haphazard, refer to the whole area, i.e., including Angus and N. Fife. *The Status and Distribution of*

Wild Geese and Wild Duck in Scotland by John Berry appeared in 1939 and was the first attempt at a comprehensive review of the status of wildfowl in each of the country's twelve faunal areas. Based on information collected from ornithologists, wildfowlers and others it presents a methodical summary of existing knowledge but, in the absence of numerical detail, has again to rely on such indefinite terms as "abundant" and "rare." *The Birds of Scotland* by E. V. Baxter and L. J. Rintoul, published in 1953, is the standard work on Scottish birds. Details of all "first records" and "first breedings" up to 1951 are given but emphasis is again on breeding distribution and wintering status is in most instances described in general terms only. References to Perthshire in the 68 pages devoted to duck are comparatively few. The manuscript *Birds of North and East Perthshire* by Henry Boase covers the 50-year period up to 1961, but most of the wildfowl records refer to the years between 1935 and 1958. This is the first of the works referred to in which actual counts of wintering duck are given. Most of these figures refer to Invergowrie Bay but some details are available for the Dunkeld-Blairgowrie lochs and a few counts are given for other waters. *Wildfowl in Great Britain*, edited by G. L. Atkinson-Willes, was published in 1963 and contains a number of references to Perthshire in the 22-page section covering Forth and Tay. The data given are based on monthly wildfowl counts made between 1948 and 1962 but none of the Perthshire waters was covered continuously throughout this period and the relevant dates are unfortunately not stated with each table. Figures for the "regular" and "maximum" populations on various waters are given, the "regular" population being assessed from the average of the three highest counts in each season for which adequate records exist. (The same system has been used to obtain comparable figures from the present data.)

Before dealing with the distribution of each species brief reference must be made to the two factors which together determine this distribution: the feeding preferences and habits of the various species and the availability and location of suitable habitats.

Feeding preferences and habits

Dabbling ducks. The three common species, Mallard *Anas platyrhynchos*, Teal *Anas crecca*, and Wigeon *Anas penelope*, all feed to a considerable extent on the land, although in rather different ways. Mallard feed largely on seeds, including barley, and forage extensively on stubbles and potato fields. Some frequent the tidal mud flats where they take snails and small crustaceans. Teal are also primarily seed eaters but have a decided preference for wet conditions such as occur round floodwaters, in marshy ground and along ditches. Wigeon, unlike the two previous species, take mainly the vegetative parts of plants and obtain much of their food by

grazing. Shoveler *Anas clypeata*, which are very local in Perthshire, are highly adapted for filtering out fine food particles from a watery medium. Although they take some seeds they feed more on animal material than the three previous species.

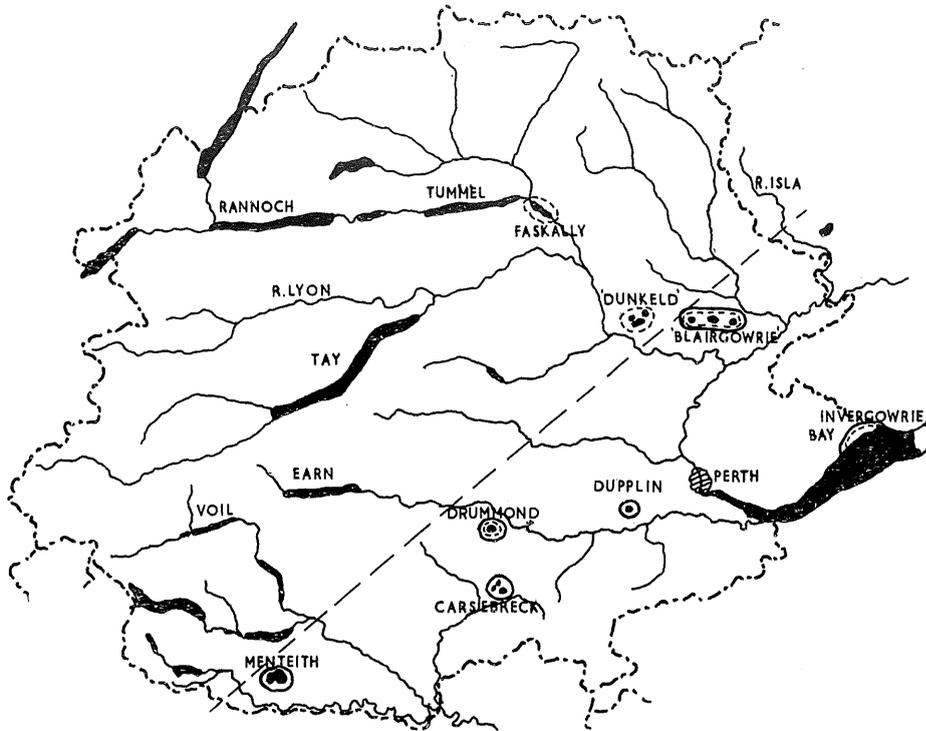
Diving Ducks. The three species, Tufted Duck *Aythya fuligula*, Pochard *Aythya ferina*, and Goldeneye *Bucephala clangula*, again show varying preferences in both foods and diving depths. Tufted Duck take a varied diet including both animal material (molluscs, insect larvæ and crustaceans) and plant material (mainly seeds) but with animal generally predominating. Their preferred depth for diving is 2—5 feet, slightly deeper than the 3 feet quoted for the more vegetarian Pochard. This latter species eats the vegetative parts of aquatic plants as well as seeds and also takes some animal matter. The Goldeneye is predominantly an animal feeder, diving in 6—12 feet of water and obtaining much of its food (largely insect larvæ, small molluscs and crustaceans) from among the stones on the bottom.

Sawbills.^r Both Red-breasted Merganser *Mergus serrator* and Goosander *Mergus merganser* feed almost entirely on animal matter, most of which is fish.

Shelduck *Tadorna tadorna*. This species has a much more restricted feeding "niche" than any of the previous species. It feeds entirely in the intertidal zone of the estuarine mudflats and its diet consists very largely of the snail *Hydrobia ulvæ*.

Availability of suitable habitats

Habitats suitable for wintering duck in Perthshire fall into four main groups: the lochs, the rivers, the estuary and the farm land, but a more discriminating classification of lochs and rivers is desirable when considering species distribution. On the accompanying map of the principal wildfowl haunts the "Highland Line" is shown running roughly S.W.-N.E. across the county and separating the productive lowland from the more barren upland area. In general the lochs lying to the north of this line fall into one of two categories: they are either very deep with stony shores or shallow, acid and peaty. Neither type is productive of plant or animal life and therefore neither is attractive to ducks, although many of these lochs are visited by smallish flocks of Mallard and occasional parties of Pochard, Goldeneye and Goosander. Exceptions to this generalisation are the lochs (Lochandaim, Dunalastair, Faskally, and Moraig) lying on or near the limestone belt which cuts across highland Perthshire. These lochs are more productive and most have good cover of reeds or sedges. Dunalastair and Faskally are of particular interest since there are notes of the ducks recorded at intervals since the lochs were formed. Dunalastair was flooded around 1933 and two years later Boase recorded Mallard there in



Map to illustrate the distribution of wintering duck in Perthshire.
 Continuous enclosure indicates areas regularly holding more than 500 dabbling duck.
 Broken enclosure indicates areas regularly holding more than 50 diving duck.
 — — — indicates approximate position of "Highland Line."

summer; Teal were noted in 1937; Wigeon and Tufted Duck in 1946; and Goldeneye in 1952. In the years immediately following the damming of Loch Faskally in 1951 the maximum population in winter was about 70 Mallard, 10 Goldeneye, and a very few Wigeon, Goosander, and Tufted Duck. By 1960 a flock of 30-40 Teal appeared regularly, Goldeneye reached 50-60 and flocks of up to 147 Tufted Duck were recorded. Recent counts have given rather lower figures for Tufted Duck and Goldeneye (max. 79 and 33 respectively in 1966-7) but Mallard and Pochard continue to increase.

Most of the lochs in lowland Perthshire are fairly shallow and are surrounded by agricultural land—both factors which tend to result in greater production of plant and animal life than occurs in lochs in more barren surroundings. Virtually all the lochs of real importance to wintering wildfowl lie in this section of the county (see map).

“Hill” and “lowland” rivers also vary both in character and in attraction for wildfowl. “Hill” rivers are generally fast and stony and carry only small numbers of Mallard and a few Goldeneye and Goosander. The “lowland” rivers are much more important to wildfowl because they are slower and generally more productive of food plants and animals; they are nearer to the feeding grounds provided by arable land and they are often liable to flood, producing large areas of shallow flood-water very attractive to Mallard and Teal. This character is particularly relevant to the Isla, the Earn, some stretches of the Tay and, to a lesser extent, the Allan Water and the Pow near Madderty Station.

The tidal mud-flats of the Tay at Kingoodie and Invergowrie Bay attract large numbers of Mallard and are also the haunt of the small Shelduck population. Flocks of Tufted Duck and Goldeneye are sometimes substantial in this area, especially in hard weather when the lochs are frozen. Further up-river duck numbers appear to be much smaller although observation is difficult, owing to the extensive reed-beds, and detailed information is lacking.

The stubble and potato fields of the arable land provide valuable feeding grounds for Mallard, while the grasslands near the rivers and lochs and the boggy ground attract Wigeon and Teal respectively.

In spite of the apparent wealth of lochs and rivers in Perthshire the amount of really suitable habitat is not great and the total wintering duck population in the county is comparatively small.

Mallard

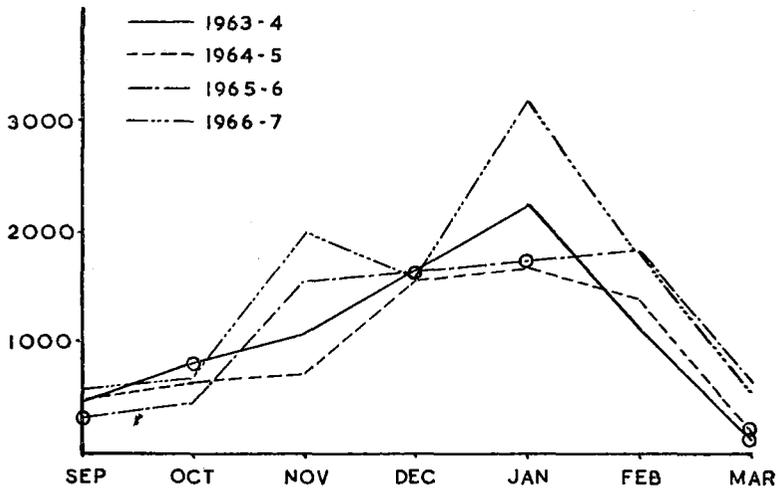
Mallard are widely distributed over the county in winter and greatly outnumber all other species combined. They have been recorded on all but four of the waters observed and occur far up

the glens, even in mid-winter. Any attempt to indicate total numbers can be no more than a "guesstimate" but, for what it is worth, it is suggested that the wintering Mallard population in Perthshire may be in the region of 10-15,000 birds. Probably 80-90% of the population is concentrated south of the highland line. The Lake of Menteith, Carsebreck, the Glendevon Reservoirs, Drummond Pond, Dupplin, the Blairgowrie lochs (Stormont, Marlee and Clunie) and Invergowrie Bay have all held upward of 500 birds, with recent peak records of 1,800 at Carsebreck and 2,240 at Invergowrie Bay. Fair numbers occasionally appear on the big lochs (e.g., 230 on Loch Tay in January, 1964, and 140 on Loch Earn in November, 1964) but as a rule flocks in the highland area number under 100 birds.

The total Mallard population in Great Britain generally reaches its peak in November and then falls gradually until March. When small local areas are considered by themselves, however, no such regular pattern may be apparent, partly because factors such as disturbance and ice-cover induce strictly local movements and have a consequently exaggerated effect. On the Blairgowrie lochs the peak winter population has occurred in each of the months October—January inclusive and at Invergowrie Bay numbers frequently remain high from December to February. If the counts for the Dunkeld lochs (Lowes, Butterstone and Craighush), the Blairgowrie lochs and Invergowrie Bay are combined a fairly regular pattern appears (Graph 1), showing a gradual build-up from mid-October to a peak in January followed by a rapid fall in February and March.

Harvie-Brown, writing in 1906, described Mallard as "very general over the whole (Tay) area" but by 1939 Berry was commenting that there had been a great decrease in the size of the immigrant wintering flocks during the previous 20 years. No further information is given by Baxter and Rintoul but Boase considers that some revival in wintering numbers has taken place since 1945. His figures and those given in *Wildfowl in Great Britain* are compared with more recent data in Table 1. These figures suggest that some decrease is again occurring, particularly in the flock on tidal water. Numbers on the Dunkeld—Blairgowrie lochs have remained fairly constant but there appears to be a tendency towards a more even distribution of birds between the two groups of waters.

At Faskally the Mallard population has continued to increase. Counts in 1966-7 gave a "regular" (average of 3 highest counts) population of 125 and a maximum of 150 as against the Monograph's figures of 35 and 75 respectively. Numbers also appear to have increased at the Lake of Menteith. Regular and maximum counts, over a 5-season period, of 145 and 310 are given in the Monograph and it is stated that "duck are now comparatively



Graph 1: Seasonal variations in Mallard numbers.
 (Combined counts for Invergowrie Bay and Dunkeld-Blairgowrie Lochs.)
 O indicates an incomplete count.

Table 1: Mallard numbers at three Perthshire resorts.

		Boase			W. in	Present	
		1910-29	1935-42	1948-56	G.B.	1957-62	1963-7
Invergowrie Bay	Reg.	—	—	—	1915	—	1250
	Max.	234	600	3200	3700	—	2240
Stormont, Marlee and Clunie	Reg.	—	—	—	555	600	485
	Max.	—	—	1288**	955	1110	770
Lowe's, Craighush and Butterstone	Reg.	—	—	—	165	160	220
	Max.	—	—	343**	265	265	490

* Figs. for Stormont, Marlee and Clunie based on 8 seasons and for Lowe's, Craighush and Butterstone on 4 seasons—no dates given. For Invergowrie Bay figs. refer to 1948-52.

** Figs. refer to 1949-51.

scarce on the Lake due to recent disturbance from water-skiing." Six counts made there during 1965-7 (4 of them in the autumn and early winter of 1965 when skiing was still in progress) gave an average population of 575 and a peak count of 800—a very substantial increase on the earlier figures.

Teal

The preference shown by this species for feeding in marshy ground and among the cover of reed-beds makes counting rather a hit-or-miss affair. Teal are often audible even when they cannot be seen and are possibly most accurately counted when sitting out on the ice of frozen lochs. The wintering population in Perthshire appears to be fairly small, possibly not much more than 1,000 birds. Teal have been recorded on 33 of the waters listed but there is no really important regular resort in the county. The biggest single flock recorded recently was one of 270 birds at a pool near Airtully in September, 1966, and the only lochs where numbers have exceeded 100 are Carsebreck, the Blairgowrie group and Lily Loch near Murthly. Faskally is alone among the highland lochs in holding a regular population (30-40 birds) of Teal. Similar numbers have occurred at Drummond Pond and Cleavage Loch and smaller groups at Haremyre, Bertha Loch, White Moss, Glendevon Reservoirs and the Lake of Menteith. Floodwater is particularly attractive to Teal and parties of 50-100 have been recorded on several occasions after flooding in Strathearn. The fields below Dupplin Castle and in the vicinity of the Dalreoch Bridge are especially favoured spots.

Harvie-Brown, quoting Millais, states that Teal "are abundant about Mugdrum Island and the adjacent mud-flats" and Baxter and Rintoul also describe the species as "one of the most plentiful ducks in the Tay area." Berry, however, considered Teal much less plentiful than formerly, while the figures given by Boase and *Wildfowl in Great Britain* confirm that numbers in the area are normally small. Boase records that since 1942 larger parties have visited the Kingoodie area but maximum numbers occur early in the season (c.1,700 in August) and most counts are under 50. He mentions a count of 200 at Port Allen in January (recent counts in that area are 44 at Port Allen in October, 1965, and 40 at Mugdrum in March, 1967) but has no records for the rivers in winter.

Data for the Teal population of Great Britain as a whole indicate a gradual decrease in numbers over the last few years but the figures available for Perthshire are so sporadic and incomplete that no comparison of trends is possible. It seems unlikely that there has been any great change in the status of this species in

Perthshire over the last 20-30 years. Although present throughout the winter in varying numbers it cannot really be classed as "abundant."

Wigeon

In many areas this species is largely estuarine in winter but since the *Zostera* vanished from the Tay in the mid-30's few Wigeon have been seen on Perthshire tidal waters, where they were formerly said to be "common." Wigeon have been recorded on 32 of the waters observed but total numbers in the county are not great, perhaps around 2,000-2,500 birds. The most regular Wigeon haunts in North Perthshire at the present time appear to be along the valleys of the Tay, Earn and Isla, where the birds graze on or near the river banks. Flocks of 40-180 Wigeon have frequently been seen in lower Strathearn (between Bridge of Earn and Dalreoch); there is one report of 250 near the confluence of Almond and Tay; 50-225 have been noted on several occasions on the Meikleour-Caputh stretch of the Tay and 150 above Logierait. Flocks of 250 and over (maximum 540 on 15th March, 1964) occur regularly on the Isla between Meikleour and Coupar Angus. About 30-40 Wigeon appear to winter on Dunalastair and parties of 50 or more have been recorded on Monk's Myre, King's Myre, Lily Loch and the Airtully pools. At Drummond Pond numbers have reached 350 and there is a record of c.600 at Dupplin. In South Perth Carsebreck is the only important resort, with numbers in the 350-450 region, but small parties of up to 20 birds have also been noted at L. Watston and L. Venachar.

Harvie-Brown considered Wigeon an abundant species in Tay and Berry confirms that this was the case prior to 1925. The marked decrease in the number of wintering migrants which occurred in the 1930's has been attributed by him to the disappearance of the *Zostera* from the tidal Tay. Wigeon are described as "scarce and irregular on the Tay" in *Wildfowl in Great Britain*—still an accurate assessment—and also as having deserted the Menteith area. Boase found substantial flocks on the Blairgowrie lochs in the early 1950's but numbers there have declined markedly in recent years (Table 2). From the available evidence it appears that the wintering Wigeon population in Perthshire is continuing to decrease

Table 2: Wigeon numbers on the Blairgowrie lochs.

	Boase	W. in G.B.	1957-62	1963-7
Reg.	c.600	280	190	105
Max.	1500*	755	455	210

* On Marlee alone.

slowly although it is possible that this apparent decline is at least partly due to a changing preference in the feeding grounds, from the lochs to the river banks.

Shoveler

This species is exceedingly local in Perthshire and practically all winter records of Shoveler refer to the Blairgowrie lochs. Stormont, which is the shallowest and most eutrophic and which has the densest cover, is the most favoured and when birds are found on Clunie and Marlee they have probably been disturbed from Stormont. In six of the last 11 years there has been a well-marked autumn passage of Shoveler in numbers appreciably greater than could be accounted for by local breeding birds. This passage varies in timing, size and duration—this last factor probably depending to a large extent on the date of the first hard frost. The peak numbers in these six years were:—70 in November, 1956; 96 in October, 1957; 18 in October and 22 in November, 1958; 52 in October and 49 in November, 1964; 28 in October, 1965; 134 in October and 90 in November, 1966. In the years 1959-63 inclusive there was no record of more than 6 birds. (No such wide fluctuations are apparent in the records for the Angus lochs, where peak counts at Kinnordy, Forfar and Rescobie have only varied between 49 and 64 in the last six years.) In Great Britain as a whole the spring passage of Shoveler is said to be more marked than that of autumn but this is certainly not the case here. Records for February-April refer, with the exception of flocks of 18 in March, 1959, and 10 in March, 1967, to under half-a-dozen birds. Apart from the Blairgowrie lochs Shoveler have been reported from Lowes (1 in December, 1963); King's Myre (4 in November, 1965, and 2 in October, 1966); Cleavage (4 in October, 1958) and White Moss (4 in October, 1966). There is no recent record from South Perth.

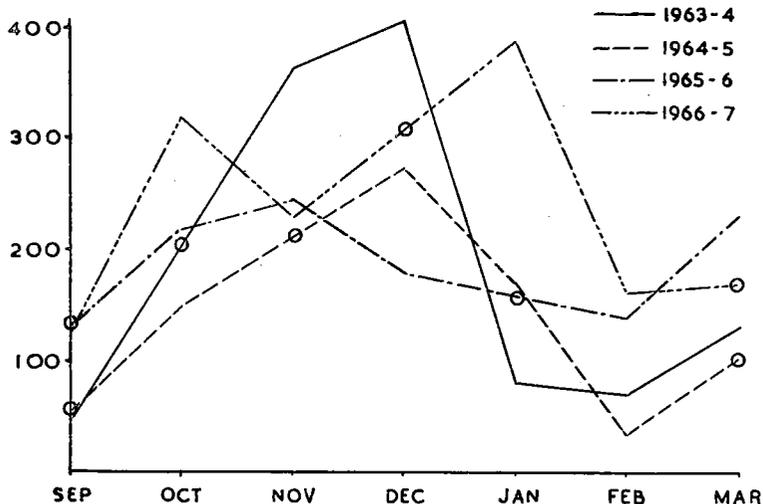
Harvie-Brown describes Shoveler as formerly rare but increasing; Berry considers them scarce and local in winter; and Baxter and Rintoul make no reference to wintering birds in Perthshire. Boase mentions "some records" for tidal water at Kingoodie but gives no details, while in *Wildfowl in Great Britain* regular and maximum figures of 10 and 95 respectively are given for the Blairgowrie lochs and no reference is made to any other resort. It seems that Berry's assessment of Shoveler as scarce and irregular in winter is still applicable, although the species may be showing some slight increase both in numbers and in frequency of appearance.

Tufted Duck

Tufted Duck are by far the commonest of the diving ducks and it is estimated that the Perthshire population may be of the order of 700-1,000 birds. Invergowrie Bay and the Dunkeld-Blairgowrie

lochs are the most important resorts but virtually all the lowland lochs hold Tufted Duck in varying numbers during the winter. On many waters counts seldom exceed 20 but substantial flocks have been recorded on Monk's Myre (82 in March, 1965); Bertha (80 in November, 1965) and Drummond Pond (140 in March, 1966). Counts on Menteith are generally small and at Carsebreck, although figures of up to 100 were common in the early 1950's, recent counts have not exceeded 60. Single birds only have been seen on the R. Earn but parties of 10-25 are not uncommon on the Tay near Perth and on the Isla near Coupar Angus. Few of the highland lochs attract any numbers of Tufted Duck. Dunalastair has held 10-12 on several occasions and small parties have been recorded on Iubhair, Fincastle, Lochandaim, Earn, Tay, Venachar, Lubnair and Ard. At Faskally only one Tufted Duck was noted in the years 1951-6; in 1960-1 a flock of around 40 wintered there and 147 were present in December but recent counts have been lower again (reg. 50 and max. 79 in 1966-7).

The numbers and movements of Tufted Duck at the main Perthshire resorts vary widely from one season to another and no regular pattern is discernible (Graph. 2). Mid-winter counts at the lochs



Graph 2: Seasonal variations in Tufted Duck numbers.
(Combined counts for Invergowrie Bay and Dunkeld-Blairgowrie Lochs.)
O indicates an incomplete count.

are obviously greatly affected by ice-cover and correspondingly the timing of the spring drop in numbers on tidal water is largely controlled by the severity of the winter. At Dunkeld peak counts are generally made in mid-winter whereas at Blairgowrie numbers are at a minimum in December-January and a maximum in March.

Both Harvie-Brown and Baxter and Rintoul concentrate on the breeding distribution of this species and make little reference to wintering birds, while Berry merely says "winters except in hard weather." Boase gives late summer, but no winter, figures for the lochs and states that whereas Tufted Duck formerly appeared in Invergowrie Bay only in hard weather they are now regular there. He found totals of 150 comparatively frequent and mentions a count of 239 in late January. In Table 3 the data given in *Wildfowl in Great Britain* are compared with counts made in the last 10 years.

Table 3: Tufted Duck numbers at three Perthshire resorts.

r		W. in G.B.	1957-62	1963-7
Invergowrie Bay	Reg.	45	—	120
	Max.	240	—	350
Stormont, Marlee and Clunie	Reg.	40	40	70
	Max.	95	80	120
Lowes, Craiglush and Butterstone	Reg.	70	65	130
	Max.	135	135	320

It appears from these figures that the numbers of Tufted Duck wintering in these three areas are gradually increasing. This is in line with the general trend in the British, and especially the Scottish, wintering population of the species, which has shown an appreciable increase over the last 15 years. The "seasonal index" (related to the 1959-60 level=100) of Tufted Duck for the U.K. as a whole increased from 50 in 1949-50 to 120 in 1965-6. For the North region (Scotland plus a small part of N.E. England) the corresponding increase was even greater—from 39 to 160.

Pochard

The distribution pattern of this species in Perthshire is markedly different from that of the Tufted Duck. Pochard are very seldom found on the rivers or on the tidal water at Invergowrie. They are, however, widely scattered over the highland as well as the lowland lochs throughout the winter and have been seen on 37 of the waters observed. Total numbers are not large and probably seldom exceed 2-300. The Blairgowrie group of lochs is again one of the most important regular resorts. Numbers there tend to peak in November and again in February-March, with a drop in mid-winter, whereas on the Dunkeld lochs there are few records from December onwards. Among the remaining lowland lochs Drummond, Dupplin,

Haremyre, King's Myre and Menteith have all held between 25 and 50 Pochard and there were 67 on Old England in October, 1966. Counts at Carsebreck in the early 1950's reached a maximum of 120 but only small parties of 10-15 have been seen there recently. On the highland lochs substantial numbers have occurred on Dunalastair (29 in February, 1965) and Benachally (27 in October, 1964) and parties of 15-20 appear to be regular on Lubnaig and Voil. Small numbers have been noted at one time or another on Venachar, Achray, Ard and Rusky in S. Perth and on Faskally, Tummel, Tay, Iubhair and Lochnacraig but there is as yet no record for Loch Earn. Throughout the winter drake Pochard outnumber ducks, sometimes by as much as 10:1, but this preponderance appears to decrease as the season advances. Examples of January and March ratios are 47:6 and 51:29 respectively.

Harvie-Brown and Berry both considered Pochard plentiful in winter and Baxter and Rintoul describe the Firth of Tay as "a favourite wintering place." Boase, however, remarks that the available records give little support for these views and there is no reference at all to Pochard on tidal Tay in *Wildfowl in Great Britain*. In the last 15-20 years the wintering population of Pochard in Britain has doubled. Numbers in Perthshire are very small but some increase is apparent here too (Table 4). Although the maximum count on the Dunkeld lochs has remained virtually the same, Pochard are seen there increasingly often (in 9 out of 35 counts between 1957-62 and in 13 out of 28 counts in 1963-7).

Table 4: Pochard numbers at three Perthshire resorts.

		W. in G.B.	1957-62	1963-7
Stormont, Marlee and Clunie	Reg.	15	20	30
	Max.	45	47	58
Lowses, Craighlush and Butterstone	Max.	15	15	16
Faskally	Max.	5	—	19

Goldeneye

This species is widely distributed, generally in small numbers, on both lochs and rivers throughout highland and lowland Perthshire and has been recorded on 36 of the waters studied. Total numbers are probably rather greater than those of Pochard and may be in the region of 3-400 birds. In hard weather sizeable gatherings are found both on tidal Tay (120 at Invergowrie in January, 1967) and further up-river (107 between North Inch and Almondmouth in January, 1965). Small parties occur frequently on the upper reaches of the R. Tay and on the Isla but there are few records from the R. Earn. On the lochs numbers are generally fairly small although substantial flocks do occasionally appear. The autumn

build-up occurs rather earlier on the Dunkeld group (25-30 in November-December) than on the Blairgowrie lochs (no count greater than 15 earlier than January). Peak figures for the two areas are 62 in February, 1964, and 70 in April, 1958, respectively, but counts are generally around 25-35. There were 44 Goldeneye on Stormont in March, 1959, but in the last 5 winters the maximum count there has been only 15. Faskally is the only other loch on which large flocks have been recorded. Numbers there increased greatly between 1951 and 1961, reaching a peak of 64 in November, 1960. More recent counts have been around 20-30. Flocks of 10-15 birds have been noted on L. Tay, Freuchie, Cashlie, Dupplin, Menteith and Glendevon Reservoirs and smaller parties occur on many other waters.

Goldeneye were regarded by Harvie-Brown as "common winter visitors" while Berry went even further and described them as "abundant from October to May." The phrase used in *Wildfowl in Great Britain*—common in small parties—implying as it does frequency of occurrence without numerical abundance aptly describes the present situation. There is an interesting divergence of opinion among earlier writers regarding the proportion of adults in the wintering flocks. Harvie-Brown quotes Millais as saying that adults are rare south of the Moray Firth but himself considers that adults are most often found on fresh water. Boase, however, reports that most of the birds at Invergowrie Bay are adult males and that this group usually forms about one-third of the flocks on the lochs (Stormont and Clunie). In recent counts on the River Tay near Perth (at the limit of tidal water) adult males outnumbered females plus immatures by 3:1 but in the loch counts, although adult drakes were still in the majority, the ratio was not nearly so wide (7:6).

Red-breasted Merganser

The Merganser is essentially a marine species in winter and only very small numbers occur in Perthshire waters at this season. Records from the lochs are confined to Menteith (where the species breeds), Drummond, Faskally, Stormont and Clunie. All refer to the autumn (September-October) or spring (March) when the birds are moving between the inland breeding haunts and the wintering grounds on the coast. The biggest number recorded inland is 12 at Stormont on 15th September, 1963. Other records involve only 2-3 birds. Small parties are occasionally seen off Kingoodie and a single drake was as far up-stream as Perth in January, 1965.

Harvie-Brown and Baxter and Rintoul refer only to the breeding distribution of this species in the Tay area. Berry describes the Merganser as less plentiful in the Tay estuary in the 1930's than 10-15 years previously, while Boase regards the species as regular at

Kingoodie between September and April but notes that numbers seldom exceed 10. He considers that a definite increase has taken place on the rivers and lochs since about 1945—but presumably this refers to breeding birds since the records detailed are for the months April to October. Little change appears to have occurred in the status of Merganser in Perthshire in the last 10-20 years and it can best be described as scarce in winter.

Goosander

Although comparatively small numbers (possibly around 100 birds) of Goosanders winter in Perthshire the species is widely distributed in both highland and lowland areas and has been noted on 26 of the waters listed. The Lowes is a favourite resort in early autumn when moulting birds gather close to the north shore. Numbers at this time have reached 56 (in September, 1965). Few birds remain there through mid-winter but numbers sometimes increase again in spring (21 in March, 1962). At Drummond an increase apparently occurs as the season progresses (7 in November, 1965; 10 in February, 1966, and 29 in March, 1966), and on Carsebreck and Glendevon Reservoirs parties of 10-15 seem usual—so long as the water remains open. Other loch records (from Tummel, Tay, Dunalastair, Faskally, Kinardochoy, Iubhair, Freuchie, Ochertyre, Glenfarg Reservoir, King's Myre, Bertha, Rusky, Ard, Venachar, Lubnaig and Doine) seldom refer to parties of more than 4-5 and frequently to single birds. Substantial numbers occasionally appear on the R. Tay at Perth (31 in December, 1965) and smaller groups are often found both further up and further down stream (22 at Mugdrum in March, 1967). Ones and twos have been recorded on the rivers Earn, Isla and Lyon and there were 4 on the Forth at Cardross Bridge in December, 1966.

Harvie-Brown details the early breeding records of this species but gives little indication of wintering distribution, while Baxter and Rintoul merely say "may be found on many lochs and rivers after the breeding season." Berry considered that the Goosander had become a "plentiful resident" since it started to breed in the area in 1871. Boase, however, records that at Kingoodie the Goosander is casual only in October-December and quite rare January-March. He regards it as casual on the Dunkeld-Blairgowrie lochs also. In *Wildfowl in Great Britain* regular and maximum figures of 10 and 30 for the Dunkeld lochs and 5 and 15 for the Blairgowrie group are given but these are somewhat misleading as both the frequency of occurrence and the flock size vary widely from one season to another (Table 5). "Not uncommon but generally present in very small numbers" might be a satisfactory description of the present situation.

Table 5: Goosander records on Dunkeld-Blaigowrie lochs.

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
	-58	-59	-60	-61	-62	-63	-64	-65	-66	-67
Stormont, Marlee and Clunie—										
No. of records	2	2	1	2	1	—	1	1	1	4
Max. count	4	8	1	5	2	—	4	1	1	17
Lowes, Craiglush and Butterstone—										
No. of records	1	4	3	6	2	1	1	—	1	1
Max. count	4	17	2	29	21	3	3	—	56	14

Shelduck

Although Shelduck may be found as far up-river as Mugdrum and the Earnmouth in summer, all the available winter records refer to Invergowrie Bay and the Kingoodie area. Numbers there drop rapidly in late summer when the birds leave for the moulting grounds and Shelduck are often entirely absent in November and December. The rate of build-up from early January onwards varies greatly from year to year. In 1961 the count was 8 in January, 52 in February and 103 in March, while in January, 1967, there were 42 Shelduck present and in March, 1966, only 36. There is no obvious reason for these wide variations although it is possible that some of the counts may have been incomplete since the movements of the birds are much affected by the tide.

Harvie-Brown describes the Shelduck as a "fairly abundant resident in Tay" and mentions that it is seldom seen further up-river than Mugdrum. Boase gives details of the considerable increase in numbers which has occurred at Invergowrie Bay and Kingoodie since 1910. He remarks that the build-up of numbers is slow and irregular up to March and gives peak figures for April and May counts. The records for the last few years are not sufficiently complete to allow of comparison with Boase's figures and with the regular and maximum counts of 60 and 165 quoted in *Wildfowl in Great Britain* for the Powgavie-Dundee area.

Conclusions

Comparatively little change in the habitats available for duck has occurred in Perthshire in the last 30-40 years. The most decisive change has probably been the loss of the *Zostera* from the tidal Tay. Better drainage of low-lying land has presumably reduced the marshy ground favoured by Teal but extensive flooding of the main valleys still occurs, and seems likely to continue, while the greater wastage resulting from mechanical harvesting of grain and potatoes must have increased the available food for Mallard. In contrast to

other areas of Britain the formation of vast new reservoirs in the county has had little effect on wildfowl numbers, since the majority of these waters are very deep, lie in barren hill country and are lacking in suitable feeding grounds. Pressure from angling and water-sport interests has been increasing rapidly and, since the waters of most value to wildfowl are also, to a large extent, those most accessible to the main centres of population, this pressure is likely to become acute in the next decade. If wildfowl numbers are to be increased, or even just maintained, in the future it is vital that some suitable waters should be kept undisturbed to provide feeding and roosting grounds.

The inadequacy of earlier records makes the detection of long-term changes in Perthshire duck populations rather difficult. The available evidence suggests, however, that little over-all change has occurred in Mallard and Teal numbers, although the former species appears to be decreasing on tidal water and increasing inland. Wigeon have shown a substantial decrease over the last 40 years and this trend is apparently still continuing. Although Shoveler numbers have always been small there are indications of a slight increase in recent years. Among the diving ducks both Tufted Duck and Pochard are at present increasing, the former substantially, but little change is detectable in the status of Golden-eye, the sawbills or Shelduck.

The paucity of records for several important waters in West Perthshire has been a serious drawback in the preparation of this review and it is hoped that more comprehensive cover can be arranged in the future. With pressures on the county's lochs increasing so rapidly, and substantial changes in wildfowl numbers and distribution likely to follow, adequate documentation is considered to be more necessary now than ever before.

Acknowledgements. I am indebted to Hugh Boyd for encouragement and advice in the preparation of this paper and to George Atkinson-Willes for permission to use the Wildfowl Count data. The assistance of the many volunteer duck-counters and the co-operation of the land-owners concerned are also gratefully acknowledged.

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Appendix

Perthshire waters for which records are available in the period 1957-67:—

LOCHS: Stormont, Marlee, Clunie, Butterstone, Lowes and Craighush—almost complete cover September-March, 1956-67; Drummond Pond—almost complete cover 1965-7; Faskally (18 counts); Glendevon Reservoirs and King's Myre (13); Monk's Myre (12); Fingask and Bertha (10); Methven, White Moss, Carsebreck, Viewlands Reservoir and Tay (9); Haremyre, Rae, Airtully pools and Menteith (8); Moraig (7); White Loch, Dunalastair, Lubnaig and Ard (6); Old England, Glenfarg Reservoir, Lily Loch and Voil-Doine (5); Iubhair and Rusky (4); Tummel, Freuchie and Glendoick (3); Earn, Lochnacraig, Kinardochoy, Buchanty, Dupplin, Benachally, Clevage, Oliverburn, Methven Moss, Venachar and Mahaick (2); Dochart, Lochandaim, Balthayock, Rohallion Mill Dam, Ochertyre, Cashlie, Achray, Watston, Con, Redmyre and Meallbrodden (1).

RIVERS: Tay (24); Earn (16); Isla (12); Allan Water (2); Forth and Lyon (1).

TIDAL: Invergowrie Bay—fairly complete cover 1962-7.

The Ring Forts of Central Perthshire

Margaret E. C. Stewart, Ph.D., F.S.A.Scot.

[Originally read to the Annual General Meeting of the Breadalbane Archaeological Society, 22nd March, 1967.]

Pennant describing his visit to Fortingall in 1769 quoted the saying, "Twelve castles had Fionn in the dark bent Glen of the Stones," and it has been repeated many times since in descriptions of Glen Lyon. Pennant was possibly quoting part of a Gaelic poem learnt from the Rev. Stewart of Killin, who was his mentor and friend, and was referring to circular stone structures whose foundations can still be traced and which have puzzled generations of archaeologists since he wrote.

The nomenclature of these sites is misleading. They have been called duns, and the dun prefix quite frequently occurs in place names near to where the structures are found. But this word has a particular archaeological connotation in the West of Scotland where it is used for small, strongly-fortified enclosures which though they may appear superficially similar are not analogous to the Perthshire examples. The Perthshire structures have also been called "ring forts." But they are not forts in the ordinary sense of the word. Many are not even defensible and few are in defensive positions. But the name ring fort is in such common use that it has become acceptable despite its incongruity.

The ring forts are circular structures averaging 60'-80' in diameter (*Fig. 1*). The fact that some are smaller, some larger, and some oval, does not impair the basic image.

The enclosing wall of dry stone masonry is immensely thick, varying from 8'-14', and has been faced inside and out by very

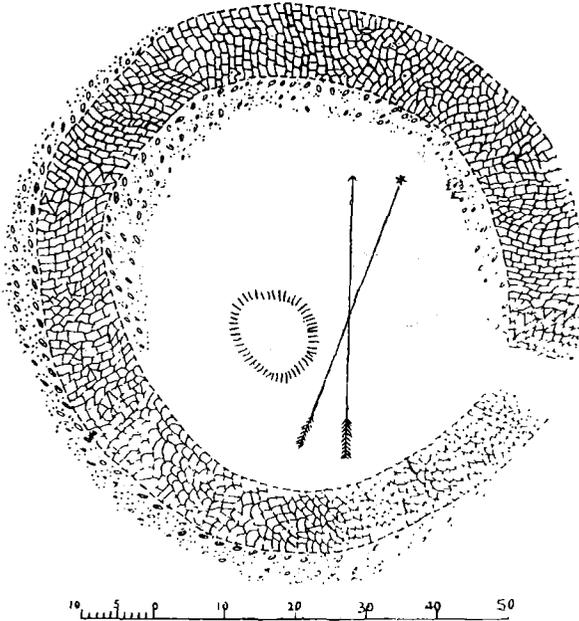


Fig. 1: Plan of Queen's View Fort, Loch Tummel.

large blocks which have been carefully chosen and placed and, in at least one example, have been built with a deliberate inward batter on the outside wall face. Because all the sites are now very badly ruined it is difficult to know how the interior of the wall was constructed. In some cases there seems to have been simply an infill of small boulders. In others, particularly at Dun Geal above Fortingall, massive stones seem to have been used throughout the width (*Plate I*). But this may have been only the foundation course. At the ring fort at Borenich on Loch Tummel, excavated by Professor Watson in 1913¹, enough of the wall remained to show that the foundation course consisted throughout of massive blocks, but above this the wall had been built of smaller rounded boulders between inner and outer facings. At Cashlie in Glenlyon a large natural boulder *in situ* has been incorporated in the outer facing of the wall (*Plate II*).

¹ P.S.A.S., Vol. XLVII, 1912-13, p. 30.



Plate I: View looking along the ruined wall of "Dun Geal."

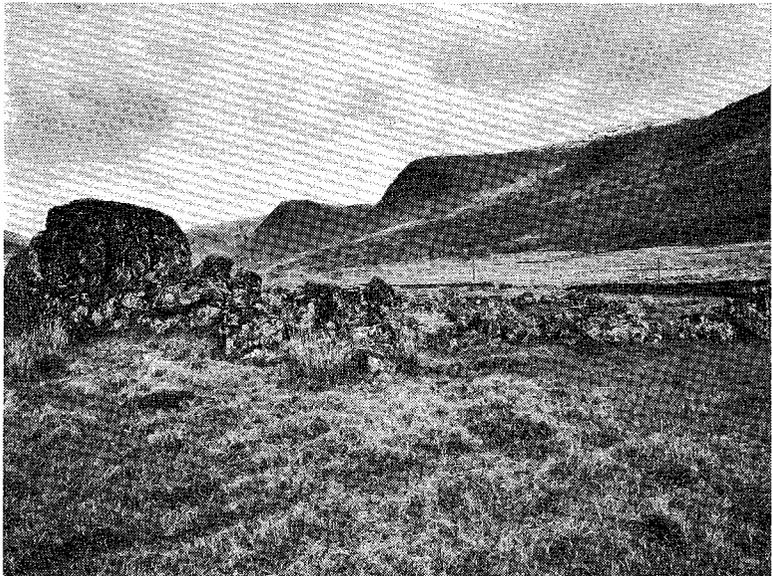


Plate II: Ring fort on north side of the road at Cashlie, Glen Lyon, showing natural boulder incorporated in wall.

There is a single narrow entrance passage through the wall. At Borenich the passage was in two portions; a narrow outer portion whose inner end had two door checks formed by a pair of slabs projecting from the side walls was combined with an appreciably wider inner portion. Watson noticed that the enclosing wall had been purposely thickened at the entrance, no doubt to increase the total length of the passage. The only reason for doing this would be to give additional protection against any unauthorised entry. There is evidence from more than one site that the inner portion of the passage was roofed by stone lintels. Most of the entrance passages were still identifiable face west.

Circular structures are not necessarily an early trait. The massive stone blocks which form the facings of the dry-stone masonry are set in a series of expanded right angles around the perimeter, and the innate strength of such an arrangement by contrast with a straight dry-stone wall is obvious. The great thickness of the walls, though they may give the impression of defensive strength, are really dictated by the necessity to raise the wall to 10'-15' in order to give maximum protection or shelter. A wall of this height would be needed to protect live stock from predators such as wolves and wild cats and it required a base of not less than 8'-12'.

Ring forts were surely never roofed. The problems of covering an area 80'-90' in diameter would be insuperable. At Dun Geal there are the foundations of huts or shelters inside the enclosing wall and from surface indications these foundations appear to be bonded into the inner facing (*Plate III*).

A distribution map (*Fig. 2*) of Perthshire ring forts emphasises Glen Lyon as the focal point and Pennant's "twelve castles of the Fionn" can still be identified.

Starting at the west end of the Glen there is a site which because of its remote situation has not often been visited. This ring fort stands at the foot of Beinn a' Chastuil on the south side of the narrow pass which links Glen Lyon westwards with Glen Lochy and Glen Orchy. It is not easy to assess the significance of the Beinn a' Chastuil site. It is certainly not placed so as to defend the pass and this lends meaning to the three or four ring forts known in the vicinity of Dalmally at the head of Loch Awe. Dalmally is either an outpost of the Glen Lyon group, and if so the Beinn a' Chastuil site is proof of coming and going between the two areas; or the Dalmally ring forts are in *loco parentis* to the Central Perthshire examples. At the moment there is not sufficient archaeological evidence to resolve this problem, but ring forts should be looked for in Glen Orchy and Glen Lochy in order to link the Dalmally group more closely with those to the east. But if, as is often suggested, the Perthshire ring forts are prehistoric

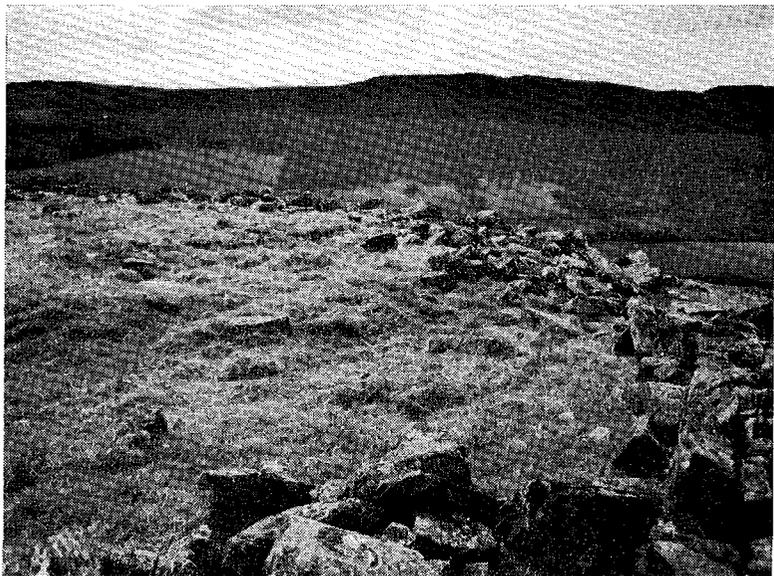


Plate III: Interior of "Dun Geal" showing foundations of internal structures.



Plate IV: View of "Dun Geal" above Balnacraig, Fortingall, showing position at edge of precipitous slope looking east.

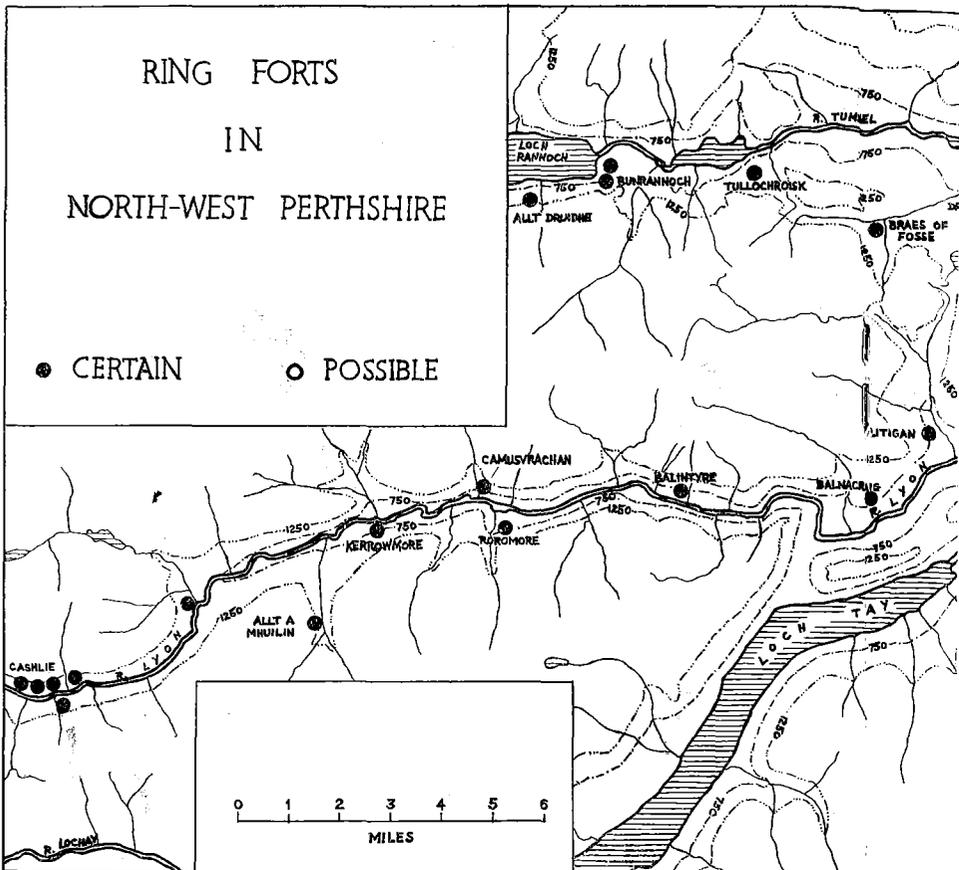
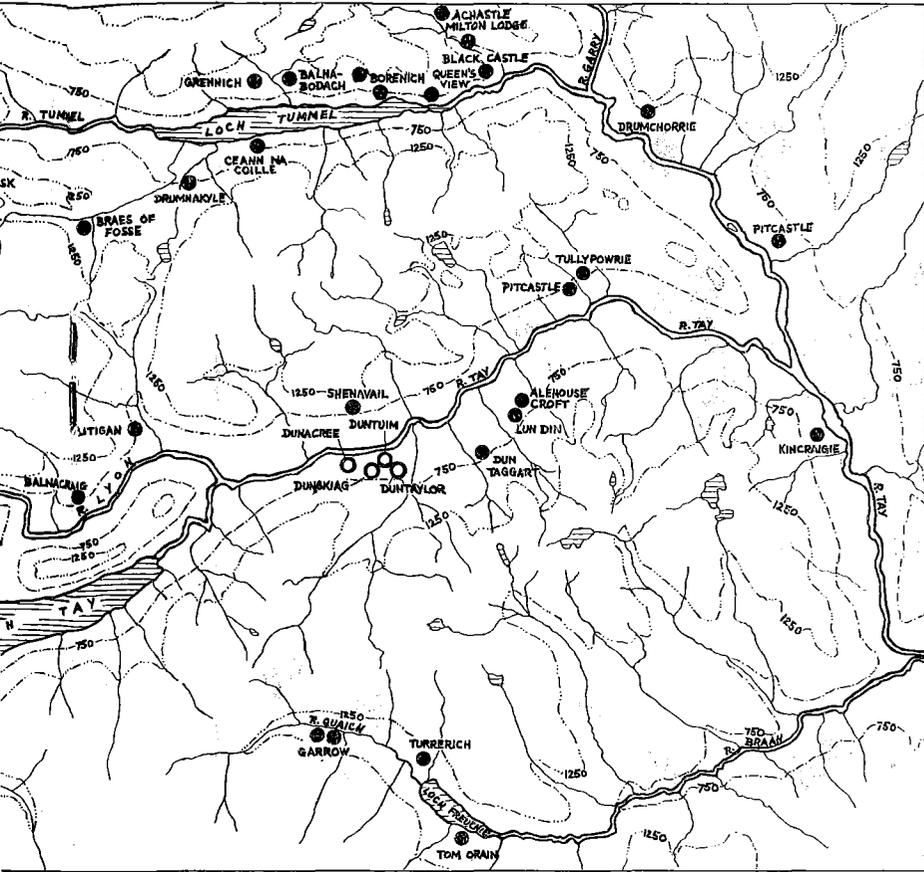


Fig. 2: Distribution Map of Ring Forts

their prototype or cognate structures of comparable date simply do not exist west of Dalmally. On the other hand if the Perthshire ring forts could belong to the Dark Ages then a western and possibly Irish origin might be feasible and this would be consistent with the siting of the Dalmally examples at the head of Loch Awe.

The futility of the name ring fort is emphasised by the siting of the most westerly group of five or six sites in Glen Lyon. These all lie within a mile or so of Cashlie, strung out along the bottom of the valley on either side of the river and overlooked on all sides by higher ground. They must have been very vulnerable to attack and it is difficult to understand why there were so many so close



Map of Ring Forts in Central Perthshire.

together if they were forts in the accepted sense of the word (*Plate VI*).

Eastward of this group there are no ring forts until Gallin, where there is now no visible structure but the tradition of one. The next group of four cluster between Bridge of Balgie and Camus Bhracuinn on both sides of the river and then there is another gap until Carn Ban at Balentyre.

Any analysis of the Glen Lyon distribution of ring forts must stem from a consideration of the two main groups. The westerly group around Cashlie is associated with good grazings, not in the bottom of the valley which must often have been subject to flooding

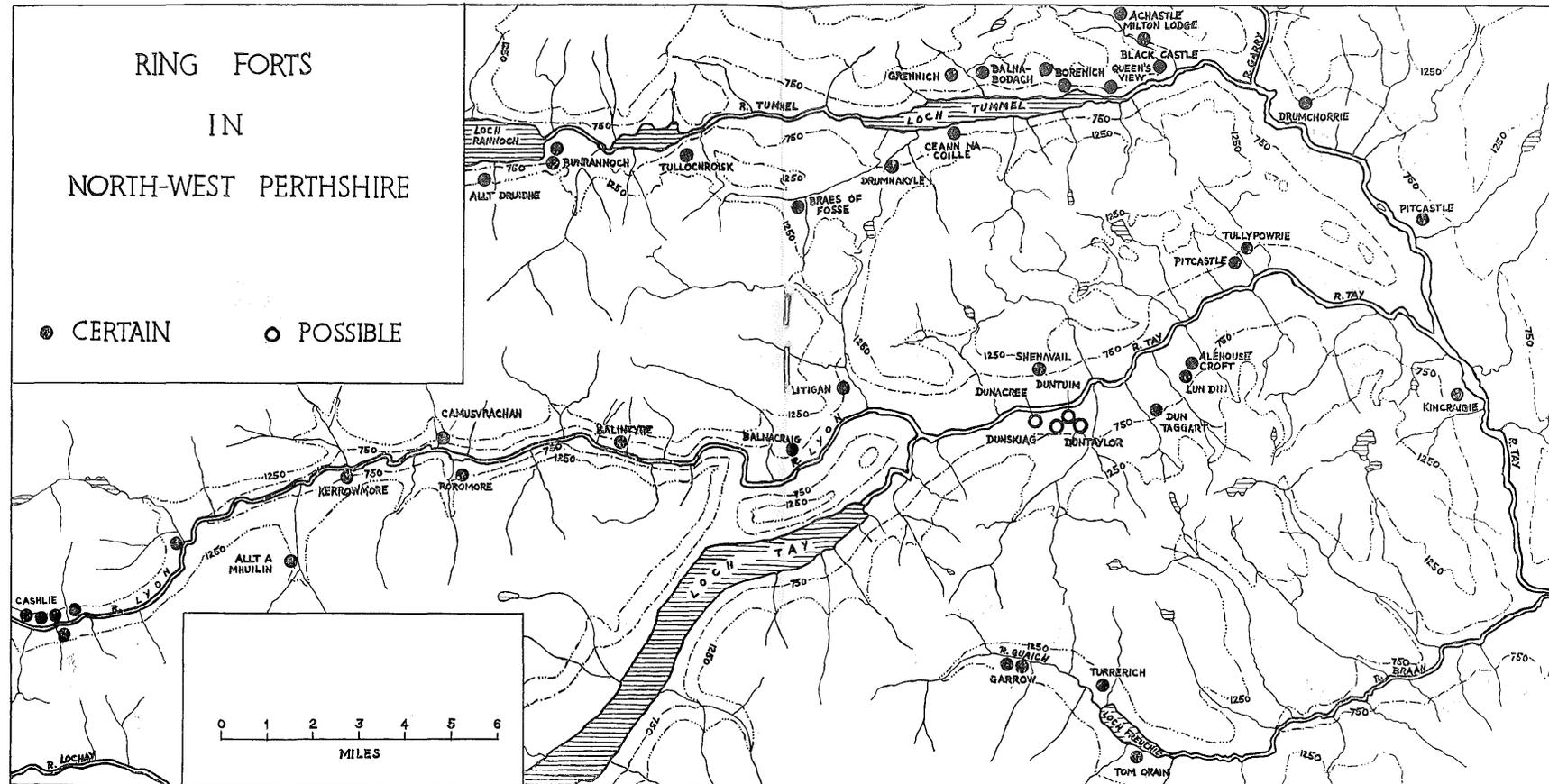


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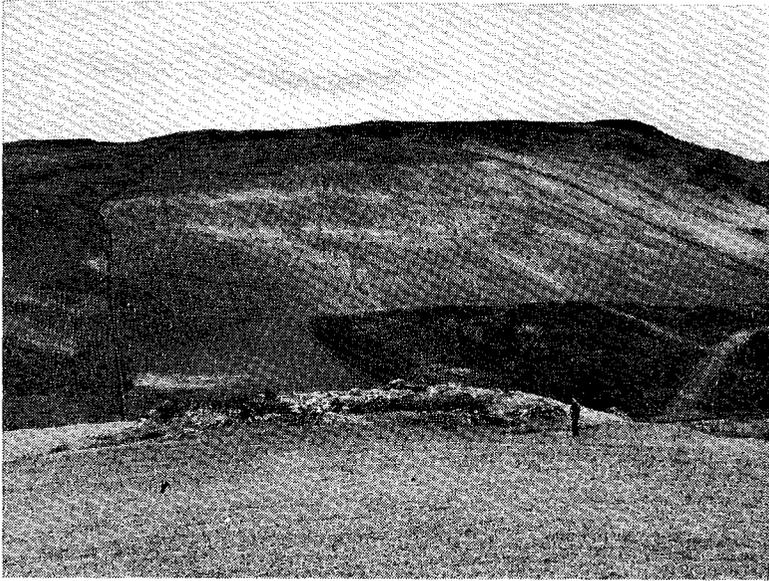


Plate V: Litigan Ring Fort from the West.



Plate VI: Background to ring fort on south side of road at Cashlie, Glen Lyon, showing open, indefensible position.

as it has been in recent years before the building of the Hydro Electricity dam, but on the high ground to the north. Glen Meran was famous for the richness of its pasture and in historic times fed large herds of Blackface sheep and Highland cattle. It is a wide open valley, easily accessible, sheltered and well watered. It leads by a low pass on to the Moor of Rannoch and all the lands immediately north of the watershed. Behind Pubil and Cashlie there are two sheltered hill grazings, the more westerly of which leads down to the one time farm of Lochs¹ on Loch Giorra. In the 18th century the shielings around Lochs were famous² and cattle were driven long distances to enjoy these summer pastures. Another approach to Lochs is by the Allt Conait burn at the mouth of which is the traditional site of the ring fort of Gallin. From Gallin there is a well recognised path across the watershed to Camghouran on Loch Rannoch. Equally from Cashlie a path goes south over into Glen Lochay by the Larignan Burn.

The group of ring forts at Bridge of Balgie maintains the relationship with hill tracks and high pastures.

The site of Milton of Eonan lies on a terrace on the left bank of the Allt a' Mhuilinn at the mouth of a glen which commands two routes across the southern watershed. One route goes to Dunchroisk in Glen Lochay, where there are the foundations of another ring fort; the other goes to Edramucky on Loch Tay. In the same way from Innerwick it is possible to cross to either Carie or Dall on Loch Rannoch, and the ring fort of Carn Ban further east at Balentyre communicates either with Carie or by way of Glen Sassunn with Kinloch Rannoch. Not far from Glen Sassunn on the west shoulder of Schiehallion are the finest high grazings in the whole district—the shielings of Glenmore, famed in Gaelic song and story.

The ring fort of Dun Geal above Fortingall (*Plate IV*) overlooks the valley from what appears to be a position of great tactical strength. But in fact the site itself is immediately overlooked by higher ground and could easily be outflanked. But it also stands alongside a high sheltered valley completely hidden from the strath below. Here there is good grazing and watering and the ring fort commands the precipitous access so that cattle could be prevented from straying too near the edge. Its real function is as a guardian of a pastoral economy, not a defensive strong-point or a look-out post. The same kind of argument is applicable to the ring fort further west at Litigan (*Plate V*).

In the lower part of Glen Lyon below Balentyre there are no ring forts, nor are there any tracks over the hills to north or south,

¹ Now drowned by the Hydro Electricity reservoir.

² Excellent barley was grown on Lochs at a place called Ach Tors at 1350' O.D.

because here the mountain barriers of the glen close in and as a result there is also a lack of good hill grazings.

The picture emerging is of a pastoral economy based on cattle and sheep. One of the ring forts in Glen Quaich is called Caisteal Dubh nan Cro (The Black Castle of the Cattle Folds) and Glen Meran at the west end of Glen Lyon is the scene of the Keppoch cattle raid when cattle from Cashlie were said to have been stolen by raiding MacDonells. The dramatic circumstances are remembered in the traditional Gaelic song *Crodh Chailean*.

Regarding the rest of the Perthshire distribution, the ring forts spread into Rannoch and can be linked to hill tracks crossing the watershed from Glen Lyon. There is an example by the south shore of Loch Rannoch east of Carie Point, and there are two close together at Bunrannoch near the foot of Glen Sassunn. There is another ring fort at Tullochroisk not far from the Tempair Burn which is the route from the north to the Glenmore Shielings on Schiehallion.

Strangely ring forts do not seem to spread from Glen Lyon south to Loch Tay, and the reason may be the very inhospitable nature of the Ben Lawers range. East of Glen Lyon the most impressive group of ring forts lie around Loch Tummel where there must be close on thirty examples. The group of eight along the north shore of this loch together with the three or four known in Glen Fincastle have obvious links with the high plateau country which stretches from Tressait and Grenich over to Glen Errochty and the valley of the Garry. Here was excellent grazing below 2000' and well watered. Hill tracks cross the area from south to north, going from Tressait and Grenich to Calvine and Invervack. In contrast to Glenlyon the ring forts never again cluster as they do at Cashlie, though pairs are known at Grenich, Bunrannoch and above the Queen's View on Loch Tummel.

Over fifty years ago Professor Watson excavated the ring fort at Borenich. Above the hard undisturbed gravel on which the ring fort had been built there was an 18" accumulation of debris. Because of the sloping nature of the site this was deeper in the lower half of the enclosure, and Watson makes the significant comment that it appeared to have been "trampled." He also mentions the disturbed slabs of a paved area. Within the enclosure he found three hearths. One against the wall opposite the entrance had left traces of burning on the stones of the inner wall facing and might well have been quite recent. A second hearth was near the wall in that half of the enclosure furthest from the "trampled" area. A third backed by two upright slabs was in the middle of the lower half of the enclosed area. Carbonised wood was scattered all over the interior of the building with "pockets of it here and there." Could these have been post holes for wooden stakes supporting some form of shelter?

His list of relics is meagre:

Half a quern—presumably but not certainly a rotary quern.

Pieces of iron, some showing traces of bronze.

A bone bodkin.

A bone implement.

A spindle whorl.

Several circular stone discs $2\frac{1}{2}$ "-6" in diameter.

All or none of these objects could be prehistoric. Remembering the suggestion of a pastoral economy based on cattle and sheep, the "trampled" area might indicate the nightly coralling of young or pregnant animals. The paved area could have been the human living quarters. The spindle whorl and the quern could point to permanent not seasonal habitation and could the circular stone discs have been lids for kegs of butter, curds, cheese and milk?

The final problem is who built the ring forts and when?

Within Scottish prehistory and at any time from the end of the 2nd millennium B.C. there may have been small groups of people living in comparatively restricted geographical regions and developing highly idiosyncratic social and economic patterns. Such groups could arise indigenously without external stimulus and could spread within the strict limitations of their particular way of life. Such a description could apply to the builders of ring forts. Alternatively the legendary association between the Fingalian heroes of Irish folklore and the ring forts might enshrine an Irish origin and find prototypes in the cashel or the small duns of western Scotland. Such a possibility is obviously incompatible with a prehistoric date. Supposing, however, that in fact the ring forts are much later; built in fact somewhere between the 8th and 10th centuries A.D.?

The ruins of these ring forts are found in close association with deserted farm buildings of late 18th and early 19th century date in Strathtay; at Lundin, Duntaggart and The Alehouse Croft, all on the south side of the valley between Aberfeldy and Grandtully. Moreover, four modern farms in the vicinity of Aberfeldy all have the dun prefix in their names—Duntaylor, Duntuim, Dunskiag and Dunacree. On the north side of Strathtay there are ring forts above the farms of Shenavil, Pitcastle and Tullypowrie.

If the ring fort distribution represents the earliest rural settlement pattern, evolving at the close of the Dark Ages, gradually consolidating through the Middle Ages, only to be disrupted by the agricultural revolution of the late 18th and early 19th centuries, then we have in Central Perthshire remarkable evidence of that continuity.

As to who built the ring forts the only indirect clue is to be found in their remarkably close association with evidence of early Christian missionary activity in this area. The proselytising of

Glen Lyon is traditionally associated with Iona, and missionaries probably entered the glen from the west by way of the narrow pass below the Beinn a' Chastuil ring fort. On the opposite side of the pass is the site of an early chapel and graveyard. At Milton of Eonan, a place name indicating dedication to the Saint who is said to have brought the faith from Iona, is the beginning of the group of ring forts which cluster around Bridge of Balgie. The mountain path southwards from here to Glen Lochay has a ring fort at the northern end on the Allt a' Mhuilinn and another at the southern end where early Christian crosses are cut in the living rock just at the point where the path leaves the precipitous edge of the burn to descend to the safety of the valley. At Bunrannoch there is an early Christian cell—Cill ma Sheonaidh—on the height of Dun Ailean, another suggestive place name. Tullochroisk above the east end of Loch Rannoch is not far from the early chapel of St. Blane at Lassintullich. In Strathtay there is an early cross slab above Shenavail and the foundation of an early chapel site at Tullypowrie.

Clearly what is required is further scientific excavation of ring fort sites in an endeavour to find dateable relics, particularly pottery. Until this happens this field survey can only indicate possibilities. But a single excavated site can only be interpreted in the light of all other comparable sites. This then is the justification of the present survey.

In conclusion, I would like to thank Dr. Horace Fairhurst of Glasgow University and Mr. David Taylor of Longforgan, who helped with the survey of the Glen Lyon sites. I am greatly indebted to Mr. J. Grant, of the Photographic Section of the Perthshire Society of Natural Science for the illustrations which accompany this paper, to The Society of Antiquaries of Scotland for *Fig. 1*, and to Dr. Horace Fairhurst for *Fig. 2*.

Postscript to *Excavation of a Circle of Standing Stones at Sandy Road, Scone, Perthshire*, by Margaret E. C. Stewart, Ph.D., F.S.A.Scot. (*Trans. Proc. Perthsh. nat. Sci.* **11**, 7-23):

All original plans and drawings, together with a complete set of photographs (not all published), letters and reports by experts on pottery, geology, carbon dating and soil have been lodged with the County Library, Rose Terrace, Perth.

The Blackfriars in Perth

Kathleen S. Simpson, F.S.A.Scot.

The first historian to interest himself in the Charters and other papers relating to the Blackfriars in Perth was the Rev. James Scott, a native of Roxburghshire, who became Minister of the original Parish of Perth in 1762, remaining in that office until the parish was divided into four in 1807. He was a well-known scholar, diligent in research and respected by his contemporaries. He was the founder of the local Literary and Antiquarian Society, the fore-runner of the Perthshire Society of Natural Science. Perhaps his most valuable legacy to succeeding generations is his folio MS. volumes, now lodged in the National Library of Scotland (ref. ADV. MS. 13.1.7). These volumes are mostly taken up with early Session, Baptismal and Marriage Registers, but also contain transcripts with notes of the charters of the old religious houses. Amongst these some fifty papers relating to the Blackfriars are copied and translated in full, whilst the remaining papers of that house are abridged or translated only in part, as Mr. Scott records "from lack of leisure." This is not surprising in view of the fact that at the time Mr. Scott worked on the papers there existed some 118 in monkish Latin and 46 documents in vernacular Scots.

In 1893, about 100 years after Mr. Scott's work, another local scholar, the Rev. Robert Milne, D.D., Minister of the West Kirk, published under the patronage of the Marquis of Bute a volume entitled "The Blackfriars of Perth: The Chartulary and Papers of their House." Here for the first time all the documents then extant are transcribed directly, either from the chartulary or the originals. In the century which had elapsed the Account Book of the Friars (*Liber Ratiotinarii Fratrum*) had been lost, but Dr. Milne reproduces it from Mr. Scott's MS. translation, so that the record is as complete as it would have been at the end of the 18th century. In his book Dr. Milne does not provide translations, deeming it "unnecessary for those likely to feel interested in a volume of this kind."

Unfortunately, during the 75 years which have elapsed since Dr. Milne's book was published, the Chartulary has gone missing. This is a parchment volume containing 113 folios and is the property

of the Managers of King James VI Hospital, Perth. It was in the possession of the Managers in 1877, when it was briefly described in the Historical Manuscripts Commission Sixth Report, pp. 714-5, and as it was printed in Dr. Milne's book in 1893, it must be presumed to have been in existence at that time. It may well have been borrowed at some later date by a local antiquary who failed to return it to the Managers. Despite considerable search and enquiry during the past 11 years by the Agents for the Managers, the Hospital Masters, and others, this valuable MS. volume has not been found.

Who then were the Blackfriars and how did they come to be in Perth? The Order was founded by Dominic de Guzman under confirmation of two Papal Bulls dated 1216 in which they are designated Friars Preachers. As they wore a black mantle, they became known as the Black Friars. Therefore, the terms "Friars Preachers," "Dominicans" and "Blackfriars" are synonymous.

Dominic was a Spaniard, a man of the Church and a Canon Regular under the Rule of St. Augustine. In 1203, when he was 33 years old, he was chosen to accompany an embassy north of the Pyrenees and it was while travelling in the south of France that he discovered a faith and morality being practised quite contrary to the Church of Rome. When his work with the embassy was finished he set about counteracting this heresy by teaching the faith wherever people would listen to him and very quickly gathered round him companions sympathetic to his work. Protected by the Bishop of Toulouse they formed a little community and in due course Pope Honorius III established them as one of the approved Orders, under Master Dominic.

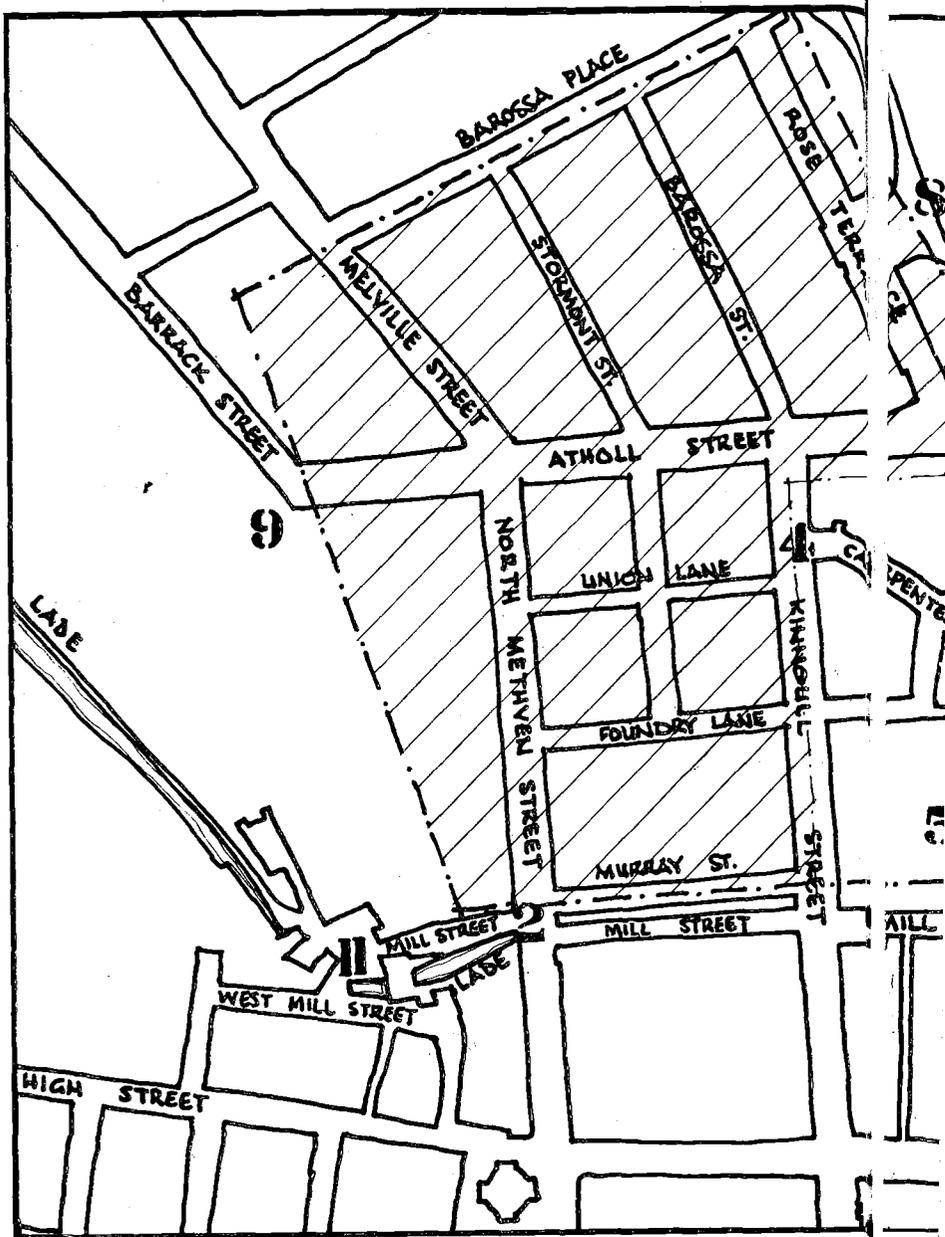
Dominican friars are first reported in England in 1221, where they appear to have been warmly welcomed by the common people, as were the Franciscans who followed them in 1224. The life of hardship practised by the mendicant friars contrasted sharply with that of the regular orders, who preferred the seclusion of monasticism, and there is no doubt that in the beginning at any rate they were zealous in preaching to the poor, the destitute and the ignorant, a section of the populace hitherto largely ignored. Eight houses of the order were established in Scotland by Alexander II between the years 1230 and 1234, Perth being established in 1231. The others were at Edinburgh, Berwick-on-Tweed, Ayr, Aberdeen, Elgin, Stirling and Inverness. It is possible that a small advance party of the friars was already living and working amongst the people of these towns before the House or Place was established; for example, it is known that a number of Franciscans lived in Perth before their Monastery was founded by the 1st Lord Oliphant in 1460.

It is impossible to say precisely where the House itself stood—no vestige of it remains—but with the help of the plan provided by Dr. Milne and the Charters and other papers, an indication of the

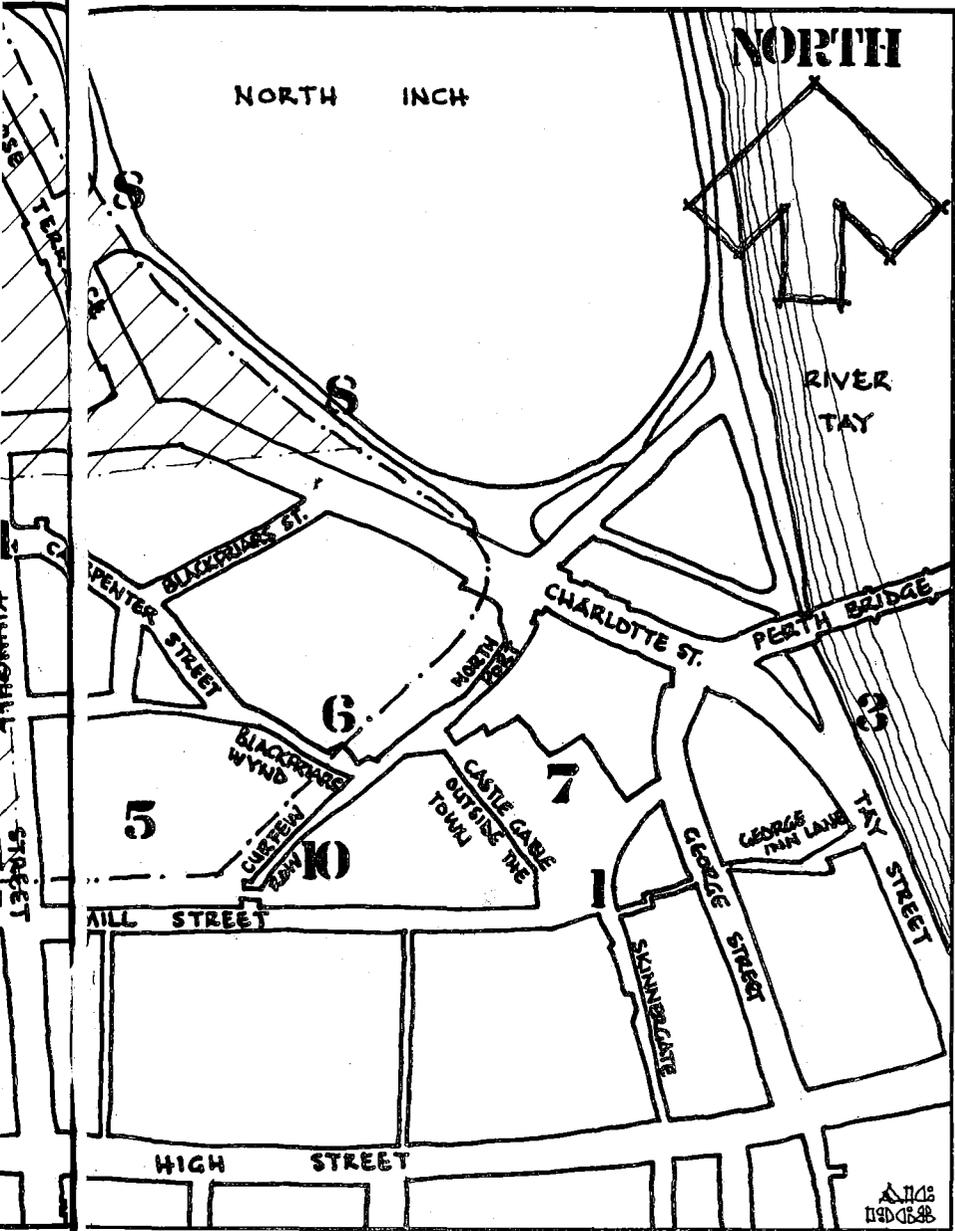
approximate area acquired by the Friars during the three centuries of their existence is shown, enclosed by a broken line, on the accompanying map (pages 36-37). All four religious houses were situated outside the mediæval town of Perth, the Blackfriars to the north, the Carmelites to the west, the Carthusians to the south-west and the Franciscans to the south. It should be kept in mind, too, that during the whole life of the Monastery the northern boundary of the town was delineated by the Mill Lade, now underground, but then open and crossed by a bridge at the north end of Skinnergate (Marked 1 on the map. Subsequent figures in brackets refer to this map). The Lade itself runs from the north-west corner of the old town (2) and discharges into the river just south of Perth Bridge (3). Apart from Curfew Row, Blackfriars Wynd and North Port, no streets existed, nor indeed was this area built up for at least 200 years after the Friars' departure in 1559.

Access to the Monastery from the town was by Skinnergate (formerly Castlegable within the Town) and Blackfriars Wynd. Dr. Milne states that the House itself stood to the north of the Wynd, the north-west corner of the building being at the junction of present-day Carpenter Street and Kinnoull Street (4). It is probable that the buildings formed a quadrangle, the southern part consisting of the church, with burying ground attached (now under part of Pullar's Works (5)). The church was dedicated on 13th May, 1240, by Bishop David de Bernham in honour of God and the Blessed Virgin, and contained altars to St. John the Evangelist and Nicholas the Confessor. Outside the building but within the Monastery wall lay the garden and orchard, the dovecot and dovecotyrd, the gardens on the east side of Carpenter Street being to-day's reminders of a pleasant environment. The King's Lodging, within the confines of the Monastery, although set apart from the House itself, overlooked the North Inch, bed and board being provided for the Royal Court from earliest times. Indeed it was the normal residence of the sovereign while in Perth until the assassination of James I on 21st February, 1437, when somewhat naturally both convent and town began to decline in royal favour. The break in Blackfriars Wynd at the angle of the "Fair Maid's House" should be noted at this point (6). Building lines are one of the most permanent features in urban development and it may well be that this break in the Wynd would form the original entrance to the King's Lodging. It is also significant that with the destruction by flood in 1210 of the Castle, which was in close proximity to this area, no proper accommodation would be available to the sovereign until such was provided by the Blackfriars.

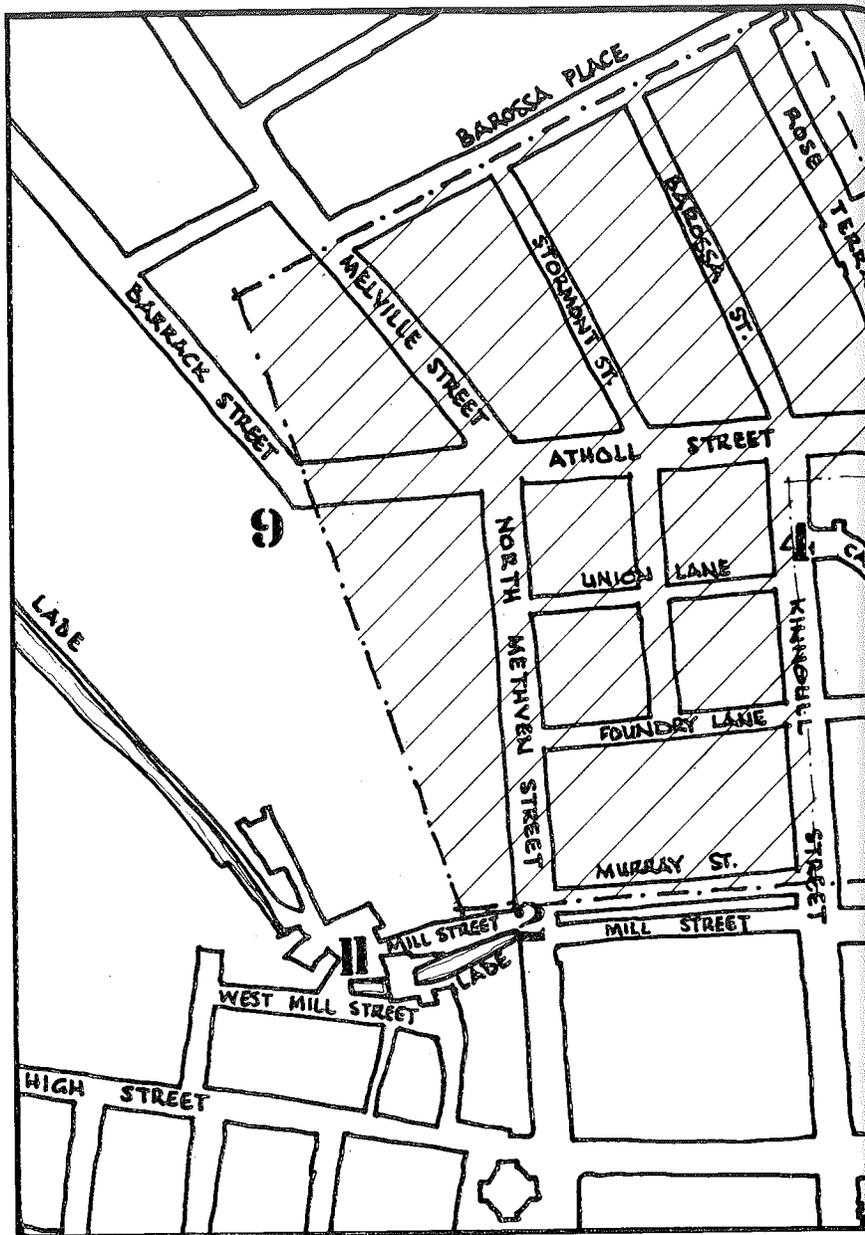
With regard to the buildings themselves, in the beginning simplicity was the rule to be followed by the Dominicans, and so far as the King's Lodging was concerned, royalty in early times were content with comparatively limited accommodation, so that the



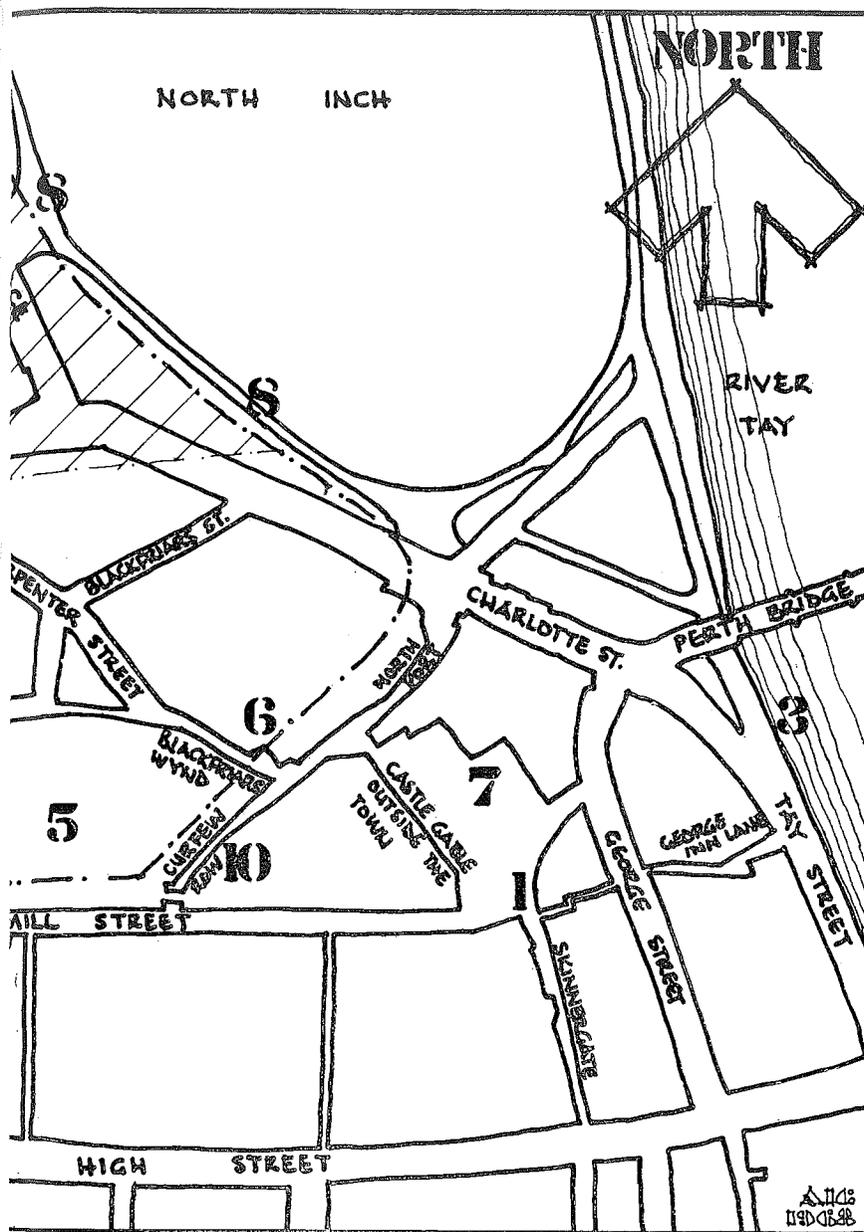
Street Map of present-day Perth, north of High Street
Based upon the Ordnance Survey Map with the sanction of the Controller



of High Street, showing area occupied by Blackfriars.
 Controller of H.M. Stationery Office. Crown copyright reserved.



Street Map of present-day Perth, north of High Street.
Based upon the Ordnance Survey Map with the sanction of the



Street, showing area occupied by Blackfriars.
Controller of H.M. Stationery Office. Crown copyright reserved.

establishment would be quite unpretentious. It was, however, likely to be one of the most substantial in Perth when one considers that, as well as the Royal Court, various synods and councils, both ecclesiastical and civil, were convened in the Place of the Blackfriars. Edward I of England on 24th July, 1291, received the homage of the burgesses of Perth and of the landlords of the country in the Blackfriars churchyard. One especially notable gathering took place in 1275 with the somewhat unwelcome visit of a Papal Nuncio. He came to make a valuation of ecclesiastical benefices for the purpose of imposing a tithe to provide money for the necessities of the Papal court and for carrying on the Crusades. A later guest was the Wolf of Badenoch (brother of King Robert III) who did penance for the wrongs and sufferings caused to the church when he burned the city, canony and cathedral of Elgin.

The normal complement of friars in permanent residence was twelve or thirteen, with servitors and other functionaries and certainly a gatekeeper. So far as their sustenance is concerned, the Account Book^s shows that during the year 20th June, 1557, to 19th June, 1558, their total money income was £148:10:8d Scots, made up of rents, feu-duties and other annual payments arising from the endowments bestowed on them during the three centuries they were in existence. Also included is the income from burials in the Friars' Kirk, where a varying scale seems to have applied. For example, the funeral procession and lair "of a woman in Scone" cost 13/4d, that "of the Laird of Petcullane" (Pitcullen) 10/-, and "the layr of a bairn" 4/-.

The earliest endowments were Royal bequests, while later on the citizens of Perth and its surroundings were generous in their gifts of land and monies, usually for the saying of masses for the souls of themselves and departed relatives.

The Charters mentioned hereafter have been given, for ease of reference, the numbers assigned to them by Dr. Milne.

Charter No. I dated 1241 is by Alexander II, founder of the Monastery, for payment annually of a piece of wax (a "piece" probably being some measurement of weight) for the lighting of the Church. Alexander III (Charter No. II) confirmed the gift in 1249 and added to it one day's sustenance weekly—4d per friar. In 1266 (Charter No. III) he ordered the Provosts of the Burgh to pay annually five chalders of grain, ten chalders of malt and £7 16/- in money from the Farms of Craigie and St. Magdalene's. In 1244 (Charter No. V) Alexander II granted a conduit four inches square from the dam of the Town's Mills to provide the Monastery with its own water supply and, in the same Charter, a piece of ground which has been the subject of conjecture by almost all local historians who have written about it. This was the King's own garden, afterwards known as the Gylt or Gylten Herbar. Dr. Milne, along with other writers, indicates that this area of ground had some

structure built upon it and was situated at the south end of what is now Rose Terrace. There are 11 documents dated between 1535 and 1553 concerning a complaint by the Friars against the Provost, baillies and community of the burgh who had entered upon this land, knocked down a wall and built butts for the practising of archery. There is no evidence in any of these papers that a structure was built on the ground. It is described as green lea used for the grazing of the Friars' beasts, bounded on the east by the North Inch of the burgh, commonly called the Gilt Herbar, but in "auld tymes" the King's Gardyne, which piece of land had "without interruptione, continuallie, past memorie of man" been in the peaceable possession of the prior and convent. In view of the fact that it was the the King's own garden, it may be that this ground was originally part of the environs of the Castle.

In 1320 (Charter No. XI), King Robert I conferred 40 cart loads of peats yearly from the forfeited estates of Sir John de Logie to be won from the muir or moss of Logie by the tenants and carted to the Convent of the Blackfriars. Later papers show that there was difficulty in enforcing the delivery of these peats. Another valuable boon from King Robert I (Charter No. XII) was the exemption from payment of multures at the Town's Mills (11). This mill tax was a heavy oppression on the citizens and the cause of much resentment. For example, Perth bakers had to pay the twentieth boll (Penny's Traditions of Perth, p. 18).

The last Royal gift recorded (Charter No. XXIV) is the Chapel of St. Lawrence granted by King Robert III, whose mother, Elizabeth Muir, was buried in the Friars' Church. The Charter is dated 1405. Dr. Milne states that the Chapel was situated in the district of the Castlegable (7) to the south and east of the Convent, but its whereabouts are presently unknown. It may be that it can be identified with or came in place of the Chapel of the Castle which was bestowed on the Abbey of Dunfermline (Bannatyne Club edition of the Registrum de Dunfermelyn, 1842, pp. 24, 29, 41, 47). In a Precept signed by the Earl of Arran (Regent on the death of James V) in 1543 reference is made to waste land whereon the Chapel of St. Lawrence sometime was built and the Provost and Baillies of Perth are requested to compensate the Friars for the use they have made of this land. By the 17th century the place name of Chapelhill appears in local records. According to the Register of Perth Kirk Session an item dated 23rd August, 1619, states that for feuing purposes the Sheriffs will convene at Chapelhill outwith Castlegable in all time coming instead of at the Mercat Cross, and the Old Rental Book of King James VI Hospital describes a property as "outside the Castlegable Port (1) on the north side of Chapelhill."

Perhaps the most permanently valuable gift to the Monastery was that made in 1333 (Charter No. XVI) by John Brown of seven

acres of arable land which he had recently acquired from John Aylboch, burges of Perth, as the price of the latter's ransom. This is the period when the contest between David Bruce and Edward Balliol for the crown was at its height. Perth was frequently besieged and occupied by forces of the contending parties and it can only be presumed that John Aylboch was captured in an armed engagement. The gift was to be applied for the sustenance of the Friars and the repair of the Monastery buildings which may have suffered in the recent troubles. These seven acres, subsequently known as Blackfriars Croft, adjoined the Convent and lay to the west and north of it, being bounded on the north by the lands of Balhousie (approximately Barossa Place), on the east by the water gang from Balhousie (8) and on the south by the lands of Salcur, a place name which seems to have disappeared entirely. It must be presumed that Salcur lay somewhere to the south of Atholl Street. During the years which followed John Brown's endowment, further gifts of land by other citizens of Perth enlarged the Croft until it finally extended to 22 or 23 acres (hatched diagonally on the map). An undated Charter (No. XXVI) by Thomas Lyn, burges of Perth, gives his croft of Clayhill, which was bounded by the Mill Lade on the south (i.e., Mill Street). Another undated Charter (No. XXVII) by Henry Pullour disposes his croft immediately adjacent to Clayhills. In 1491 by Instrument of Resignation (Charter No. XXXVIII) Elizabeth Sandilands, widow of James Fotheringham of Fordaile (Fordell?) gives her house and orchard adjoining the Friars' Croft and bounded on the south by the lade. Other smaller gifts and purchases of land increased the area of the Croft so that in 1547, when a Lease was entered into between the Friars and John Malcolm, baker in Perth, the Croft is described thus—"lying on the north and west parts of their said Place betwixt the mill laid of the said burgh on the south part, the lands of Balhousie on the north part, Drumharis yards on the west (Dr. Milne identifies this with the Barracks (9)) and the North Inch of the said burgh and the yards of the said Place on the east part." The croft does not appear to have been worked by the Friars themselves. In the Lease mentioned above it is stipulated that the Convent and tenant shall furnish equally between them all things necessary for the labouring and manuring of the ground, the corn and straw to be divided equally when harvested, while for rent the tenant was to pay 40 bolls and 40 pecks of beir.

By the middle of the 15th century the Friars had acquired orchards and lands situated between the North Inch and the Convent and further land to the south of the Convent (Curfew Row (10)). As this ground lay outside the Monastery wall, it was feued off in lots for building purposes and we see skinnners and glovers moving into the district. A Feu Charter dated 20th November, 1475 (No. XXV) to John Frew and his wife Isabella of land adjacent to

the Monastery is identified by Dr. Milne as being the site of the "Fair Maid's House." In 1629 the property was acquired by the Glover Incorporation (R. Scott Fittis: "Curious Episodes in Scottish History"), the ground and first floors being used as workshops in connection with the trade, while the loft was used as a meeting hall.

Research for this paper has been confined to documents relating to the area occupied by the Friars immediately adjacent to the burgh of Perth, but it should be made clear that valuable gifts of money, grain and land in the county were also made. Briefly, these concerned Inchyra and Flawcraig in the Carse of Gowrie, Littleton in the parish of Longforgan and the lands of Inchmartin and Kinnaird.

So far as the town is concerned, the records show that by 1535 the mood of reformation is reflected in the attitude of the people. There was the Complaint made by the Friars concerning the Gilten Herbar already mentioned. On 14th May, 1543, seven young men of the burgh broke into the Monastery between 8 and 9 a.m. whilst the brethren were occupied in divine service, destroying doors and locks and taking away with them chandeliers and glasses. They also removed from the fire the great kettle containing meat, which was paraded through the town to show the people how well the Friars dined. The value put upon these articles was—2 brass chandeliers, 20/-; 1 large kettle, £3; 2 glasses, 3/-; locks of doors and gates, 8/- each, and 2 pewter dishes, 6/- each. In 1551 the townspeople "mair by nicht than by day" came and sowed "wald seed" amongst the barley in the croft. Dr. Milne makes a note to say that "wald seed" is the *Reseda luteola*, L., familiarly known as dyers' weed, which would seriously damage both crop and soil. Against all these depredations the Convent somewhat despairingly invoked justice "if sic there be" but justice was dilatory, Judges and Arbiters appointed by the Crown being reluctant to enforce decrees against the will of the people. The Account Books for the last two years, 1557 to 1559, provide the best evidence of all of the growing contempt of the people. They were audited every two or three weeks by the Prior, David Cameron, and show how the receipts gradually diminished, the last items being recorded on Easter Sunday, 26th March, 1559. Nothing further had been received when the Prior signed the docquet on Sunday, 6th May. On the following Thursday, 11th May, John Knox preached his inflammatory sermon in St. John's Kirk, as a result of which the reforming congregation entered upon all the religious houses and the Blackfriars fled. In his statement following this day's eventful happenings Knox said "the lyke abundance as in the Grey Freris was not in the Blak Freris and yet there was more than became men professing povertie" (Knox's History of the Reformation, Vol. 1, p. 163, Ed. by William Croft Dickinson).

After the Reformation the whole property of the Blackfriars along with the other Monasteries was gathered together for behoof of the poor of the town under the trusteeship of the Managers of King James VI Hospital, which still continues to administer the funds.

The last Friar whose name appears in local records is John Gray. In 1577 he raised letters to get his pension owing to him as one sometime of the Brotherhood of the Blackfriars. He was rebuked by the Kirk Session and agreed to abandon the process "in hope of good payment in time coming."

Acknowledgements. I am grateful to Mr. Stuart Maxwell, of the National Museum of Antiquities of Scotland, who arranged for the provision of the photograph illustrating the Seal. My thanks are specially due to Mr. A. I. Cochrane, Architect, who adapted the map for the purpose of this article.



Impression of Seal.

The seal matrix (NM47) is in the National Museum of Antiquities of Scotland.

In Stevenson & Wood's "Scottish Seals" (Vol. 1, Public Seals, p. 207) it is described as follows:—

Perth, Friars Preachers, 1525. Office of the Prior.

In canopied niche with tabernacle work at sides, a figure of the Virgin, crowned, holding the Child on her left arm. Beneath in an arched niche a friar kneeling to dexter, looking up in adoration. Legend, *S OFFICII: PORIS: ORD: PDICARU: DE: PTH.* Cabled border. Pointed oval, 1 15/16 ins. x 1 3/8 ins.

Perthshire Stoneworts

Bruce Ing, M.A., M.Sc., F.L.S., F.R.E.S.

The first account of the Charophyta (Stoneworts) of Perthshire is in White's *Flora* (1898) in which nine species were recognised. Most of the records were based on the series of specimens collected by Abram Sturrock of Rattray in the Blairgowrie lochs between 1881 and 1885. These are in the herbarium of the Perth Museum as are collections made by E. S. Marshall between 1887 and 1891 and R. Kidston in 1879 and 1884. Additional information was published in the early part of the century, the most interesting record being that of *Nitella spanioclema* (Smith, 1923). In recent years the only local workers have been Dr. A. J. Brook and the present writer.

Charophytes are green algae with specialised branching and unusually complicated reproductive organs. Stoneworts are found in fresh and brackish water habitats throughout the world, being commonest in warm, temperate regions. They prefer neutral to slightly acid water although several species secrete a coating of lime and are therefore commoner in alkaline waters. Clean water over a sandy or muddy bottom provides the best situation, whether the water is still or moving slowly. They cannot tolerate shade or the accumulation of dead leaves and therefore do not occur near trees at the water's edge. Strongly growing flowering plants quickly crowd them out although they can grow in very deep water if it is clear. Stoneworts are among the first plants to colonise newly-dug or cleaned-out ponds and ditches. Many species can be regarded as annuals and their appearance in the same spot in successive years is unpredictable. When formed, fruits are dispersed by water currents and on the feet of birds; they are also spread by being

incorporated in caddis cases. Perennial species may survive for many years, producing new shoots from an over-wintering base. Food storage bulbils are found at the roots of *Chara aspera*.

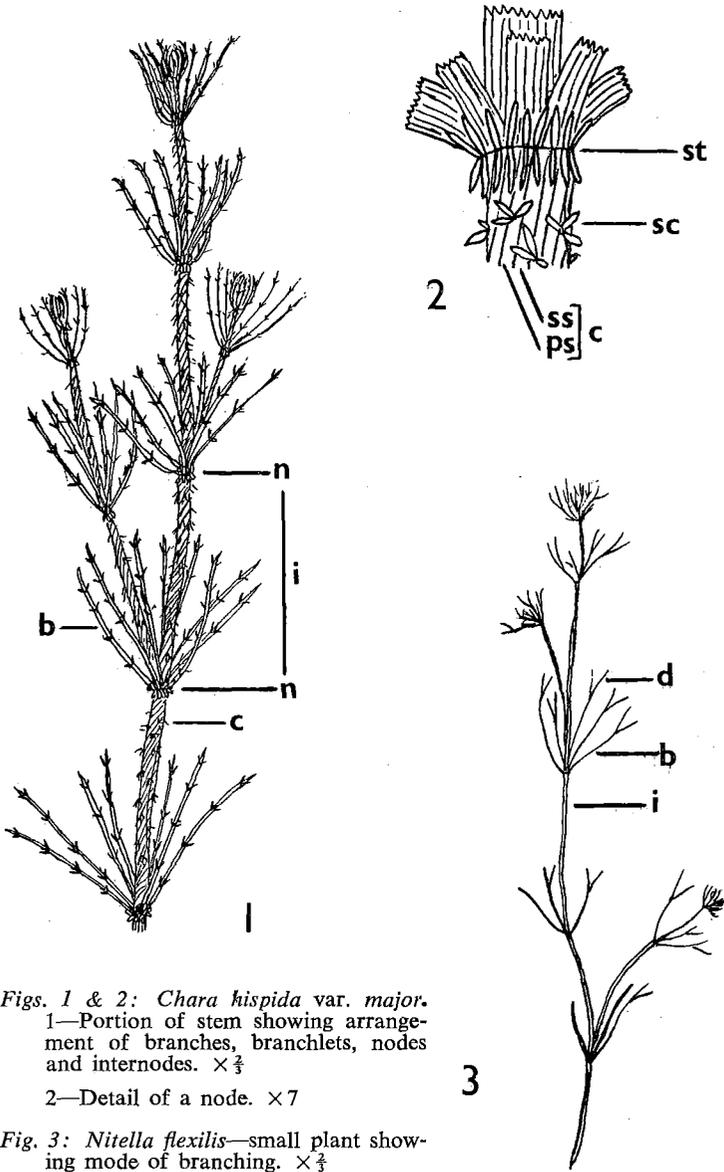
The drawings illustrate the main features of charophyte anatomy. The stem of *Chara* has a **cortex** of short longitudinal filaments bound round a central stem cell which is itself equivalent in length to the internode, i.e., the piece of stem between the whorls of branchlets. The cortical cells are separated vertically by **spine cells**; the row of cortex with spine cells being the **primary series**. In a **double cortex** the primary series are separated horizontally by a row of spineless cells, the **secondary series**. In a **triple cortex** there are two secondary series to each primary series. The relative width of these series is of value in identifying species. The spines are also important—either well developed as in *C. major* or almost absent, reduced to a flat circular disc, as in *C. globularis*. Where the whorls of **branchlets** arise are **nodes**, with two tiers of short, stubby filaments around the stem. These are the **stipulodes** and they correspond with the cortical series.

The branchlets have a simplified cortex which becomes simpler as the branching continues. In some species the branchlets have no cortex and are called **ecorticate**. On the branchlets the reproductive organs are situated; each is surrounded by filamentous **bracts** which are useful in separating species. The organs themselves will not be considered further as they require high power microscopic study.

A few species of *Chara* are encrusted with calcium carbonate which renders examination of the above features difficult. The lime is best removed with dilute acetic acid (i.e., spirit vinegar). Old material can be softened by boiling in dilute potassium hydroxide solution. A strong hand lens or low power binocular microscope is sufficient to distinguish the Perthshire species.

In *Nitella* there are no cortex, spine cells or stipulodes and little lime. The species may be distinguished partly by the number of cells in the terminal portion of the branchlet—the **dactyl**. Under the low power microscope one may easily observe cytoplasmic streaming, **cyclosis**.

Charophytes are easy to collect, although a drag may be necessary in deep water. Fresh material has a strong, offensive smell which never really leaves a preserved specimen. Plants should be floated out on to paper in a dish of water and arranged while wet. They will usually stick to the paper without adhesive or gummed strips. The standard British work is that of Groves and Bullock-Webster (1920, 1924) which is difficult to obtain second-hand. A useful introduction is by Allen (1950) copies of which are still available from the Haslemere Educational Museum, Surrey (price 6/-).



Figs. 1 & 2: *Chara hispida* var. *major*.

1—Portion of stem showing arrangement of branches, branchlets, nodes and internodes. $\times \frac{2}{3}$

2—Detail of a node. $\times 7$

Fig. 3: *Nitella flexilis*—small plant showing mode of branching. $\times \frac{2}{3}$

Key to symbols: **b**—branchlet; **c**—cortex; **d**—dactyl; **i**—internode; **n**—node; **ps**—primary series; **sc**—spine cell; **ss**—secondary series; **st**—stipulode.

Recently a huge—and hugely expensive—Monograph and Iconograph has been published by Wood and Imahori (1964, 1965) which departs radically from previous taxonomic treatments. It is unusual in that it offers two parallel systems of nomenclature. The **macrospecies** concept treats plants with an overall structural similarity as members of an **aggregate species** which may be roughly equivalent to an **ecospecies**. Within the macrospecies are **subspecies, varieties and forms**, exhibiting decreasing divergence from the general specific impression. Subspecies are usually based on geographical distinctions whereas varieties and forms differ in minute structure or may be ecologically different and may represent ecotypes. The macrospecies system is cumbersome in some respects—it may necessitate the use of pentanomials—but it undoubtedly expresses the relationship of the component taxa. The second system treats the ecotypes as microspecies of equal rank. It is suggested that the rank of form is of little taxonomic value, merely reflecting an environmental modification. In the event of discarding forms the corresponding microspecies name would also disappear; in the meantime it provides a useful link with names used in older literature.

The following key is to those microspecies likely to be found in Perthshire. After the list of Perthshire species is a further list of those taxa included in the key but not yet recorded for the county although known from surrounding areas.

It is interesting to compare the total of three genera and 16 microspecies in this list with the three genera and 21 microspecies recorded for a classic area—Cambridgeshire (see Ing, 1969). Ten microspecies are common to both countries.

KEY TO MICROSPECIES

(The number following refers to the number in the Perthshire list, an asterisk denotes a non-Perthshire species.)

- | | | | |
|---|---|-----------|------------------------|
| 1 | Plants with well-developed stem cortex, stipulodes and spine cells | | |
| | | (CHARA) | 4 |
| | Plants without stem cortex, stipulodes or spine cells | - - - | 2 |
| 2 | Branches undivided, with 1-celled bracts in whorls; star-shaped bulbils on stem | - - - | NITELLOPSIS OBTUSA (4) |
| | Branches dichotomously divided, lateral bracts 2- or more-celled; no bulbils | - - - - - | 3 |
| 3 | Dactyls 1—3-celled | - - - - - | (NITELLA) 17 |
| | Dactyls 4—many-celled | - - - - - | TOLYPELLA GLOMERATA* |
| 4 | Stem cortex triple | - - - - - | (globularis agg.) 5 |
| | Stem cortex double | - - - - - | 8 |

- | | | | |
|----|--|-----------|----------------------------------|
| 5 | Spine cells well developed | - - - - - | 6 |
| | Spine cells obscure | - - - - - | 7 |
| 6 | Spine cells solitary | - - - - - | <i>CHARA ASPERA</i> (3c) |
| | Spine cells in clusters | - - - - - | <i>CHARA CURTA*</i> |
| 7 | Stipulodes obscure | - - - - - | <i>CHARA GLOBULARIS</i> (3a) |
| | Stipulodes developed on upper tier at least | | <i>CHARA VIRGATA</i> (3b) |
| 8 | Spine cells clustered | - - - - - | (<i>hispida</i> agg.) 9 |
| | Spine cells solitary | - - - - - | (<i>vulgaris</i> agg.) 11 |
| 9 | Primary cortical series more prominent; plant slender | | <i>CHARA HISPIDA*</i> |
| | Secondary cortical series more prominent; plant stout | - - - | 10 |
| 10 | Spine cells in bunches of three or in horizontal pairs | | <i>CHARA MAJOR</i> (2a) |
| | Spine cells in vertical pairs | - - - | <i>CHARA RUDIS</i> (2b) |
| 11 | Plant dark green, bract cells swollen, spine cells obscure | | <i>CHARA ATROVIRENS</i> (1b) |
| | Not as above | - - - - - | 12 |
| 12 | Branchlets with distinct nodes, ecorticate; bract cells obscure | | <i>CHARA STURROCKII</i> (1e) |
| | Not as above | - - - - - | 13 |
| 13 | Primary cortical series more prominent | - - - - - | 14 |
| | Secondary cortical series more prominent | - - - - - | 15 |
| 14 | Spine cells shorter than half the diameter of the stem | | <i>CHARA CONTRARIA</i> (1c) |
| | Spine cells longer than the diameter of the stem | | <i>CHARA HISPIDULA*</i> |
| 15 | Spine cells pointed, at least as long as half the diameter of the stem | | <i>CHARA VULGARIS</i> (1a) |
| | Spine cells short or obscure | - - - - - | 16 |
| 16 | Spine cells short, rounded; internodes long, branches short, stout | | <i>CHARA CRASSICAULIS*</i> |
| | Spine cells obscure; plant elongated, bract cells very long, cortex missing at tips of branches, giving a tapered effect | | <i>CHARA LONGIBRACTEATA</i> (1d) |
| 17 | Dactyls 1-celled | - - - - - | (<i>flexilis</i> agg.) 18 |
| | Dactyls 2- or 3-celled | - - - - - | <i>NITELLA TRANSLUCENS</i> (6) |
| 18 | Branches forking once | - - - - - | 19 |
| | Branches forking twice | - - - - - | <i>NITELLA SPANIOCLEMA</i> (5c) |
| 19 | Plants diffuse, slender | - - - - - | <i>NITELLA FLEXILIS</i> (5a) |
| | Plants with whorls of branches compacted into large, neat heads, robust | - - - - - | <i>NITELLA CALIFORNICA</i> (5b) |

ABBREVIATIONS TO COLLECTORS AND REFERENCES:—

AS—Abram Sturrock; BI—Bruce Ing; B 3—Brook, 1953; B 4—Brook, 1954; D—Druce, 1932; ESM—E. S. Marshall; M 1—Matthews, 1913; M 2—Matthews, 1923; M 3—Miles, 1903; RK—R. Kidston; S—Smith, 1923; W—White, 1898.

The list of Perthshire species has the records listed under vice-counties for convenience. The first synonym is the name used in the microspecies system—the taxa are arranged under macrospecies.

- 1 **Chara vulgaris** L. em. R. D. Wood. (All Perthshire taxa are under var. **vulgaris**.)
 - (a) **f. vulgaris** (**Chara vulgaris** L.).
 - 87 Near Dollar, W.
 - 88 Ben Lawers (*Proc. B.S.B.I.* 1: 69); South Inch, Perth, 1967, BI.
 - 89 Near Blairgowrie, W.
 - (b) **f. atrovirens** (Lowe) H. & J. Gr. (**Chara atrovirens** Lowe.)
 - 89 Glenshee and near Blairgowrie, W.
 - (c) **f. contraria** (A. Br. ex Kütz.) R. D. Wood. (**Chara contraria** A. Br. ex Kütz.)
 - 89 L. Moraig, B4.
 - (d) **f. longibracteata** (Kütz. in Reich.) H. & J. Gr. (**Chara longibracteata** Kütz. in Reich.)
 - 89 Near Blairgowrie, W.
 - (e) **f. sturrockii** (H. & J. Gr.) R. D. Wood. (**Chara sturrockii** (H. & J. Gr.) R. D. Wood; **C. fragilis** var. **sturrockii** H. & J. Gr.)
 - 89 Monkmyre, 1883, AS. Known from nowhere else in the world but not found recently in spite of repeated searching; perhaps extinct.
- 2 **Chara hispida** L. em. R. D. Wood var. **major** (Hartm.) R. D. Wood.
 - (a) **f. major**. (**Chara major** Hartm.; **C. hispida** auct. angl. non L.)
 - 88 King's Myre, 1885, AS.
 - 89 Ardblair L., 1881, White L., 1882, AS; L. Moraig, B3.
 - (b) **f. rudis** (A. Br.) R. D. Wood. (**Chara rudis** (A. Br.) A. Br. ex Leonh.)
 - 88 L. Choin, between Trinafour and L. Garry, B3.
 - 89 Fingask L., 1881, AS; Rae L., White L., W.
- 3 **Chara globularis** Thuill. em. R. D. Wood.
 - (a) var. **globularis**. (**Chara globularis** Thuill.; **C. fragilis** auctt. incl. var. **capillacea** and var. **hedwigii**.)
 - 87 Crianlarich, 1891, ESM.
 - 88 King's Myre, 1885, AS; Ochtertyre L., Lochan an Daim, W; Tulloch Hill, Blair Atholl M3; White Moss L., Dunning, M1.
 - 89 Stormont L., Monkmyre, W.; Black L., 1884, L. Benachally, Lochan na Chat, 1885, AS; Monkmyre, Scone Park, White L. 1967, BI.
 - (b) var. **virgata** (Kütz.) R. D. Wood. (**Chara virgata** Kütz.; **C. delicatula** Ag. non Desv.)
 - 87 Near Kingshouse station, W; near L. Lubnaig (*B.E.C. Rep.* 1930: 379).

- 88 Lochan an Daim, W, B3; L. Kinardochy, B3 (also *Proc. B.S.B.I.* 1: 338).
- 89 Hatton Hill, 1882, Lunan Burn, Butterstone L., 1883, AS; L. Dunmore, B3; Marlee L. (*Watsonia* 2: 62); Glen Loch, 1964, BI.
- (c) var. *aspera* (Deth. ex Willd.) R. D. Wood. (*Chara aspera* Deth. ex Willd.)
- 87 Lake of Menteith, W.
- 88 King's Myre, 1885, AS; Ochertyre L., W; White Moss L., Dunning, M1; Lochan an Daim, 1964, BI.
- 89 Marlee L. 1881, Clunie L. 1882, AS; Monkmyre, Fingask L., Rae L., Ardblair L., W; L. Moraig, B4.
- 4 **Nitellopsis obtusa** (Desv. in Lois.) J. Gr.
- 89 Marlee L., B3. The only Scottish record.
- 5 **Nitella flexilis** (L.) Ag. em. R. D. Wood.
- var. *flexilis*.
- (a) **f. flexilis**. (*Nitella flexilis* (L.) Ag.; *N. opaca* Ag.)
- 87 L. Oss, Tyndrum, 1897, RK; Lake of Menteith, Strathyre, W; Crianelarich, 1891, ESM; L. Lubnaig, L. Vennachar, S; L. Lubnaig (*B.E.C. Rep.* 1930: 379).
- 88 L. Tay, L. Turret, Balloch L., Drummond Pond, Benniebeg Pond, W; L. Dochart, 1889, ESM; White Moss L., M1; Keltie L., M2; near Killin, D; Lochan an Daim, 1964, Lawers (L. Tay), 1967, B.I.
- 89 Stormont L., White L., 1881, Lunan Burn, R. Isla, Clunie L., Marlee L., Fingask L., 1882, AS; Monkmyre, Black L., W; Kindrogan, Ben-y-Vrackie, 1964, L. Craighlush, White L., Clunie L., 1967, BI.
- (b) **f. nidifica** (Hartm. ex Wallm.) R. D. Wood. (*Nitella californica* T. F. Allen.)
- 87 Glen Falloch, 1887, ESM.
- 89 Marlee L., 1882, AS, W; Stormont L., 1882, L. Benachally, 1885, AS; White L., 1967, BI.
- (c) var. *spanioclema* (J. Gr. & B.-W. ex B.-W.) R. D. Wood. (*Nitella spanioclema* J. Gr. & B.-W.)
- 87 L. Lubnaig, S. This remains the only record for the United Kingdom; it also occurs in Donegal, Eire.
- 6 **Nitella translucens** (Pers.) Ag.
- 87 L. Watston, Doune, 1884, RK; L. Lubnaig, L. Vennachar, S.
- 88 Mill Dam and Stare Dam, Birnam, 1887, AS; White Moss L., M1.
- 89 Clunie L., Butterstone L., W.

The following taxa may yet be found in the county and are included in the key:—

Chara vulgaris var. *vulgaris* f. *hispidula* (A. Br.) R. D. Wood. (**Chara hispidula** (A. Br.) R. D. Wood; **C. contraria** var. *hispidula* A. Br.) is still present in Loch Leven.

Chara vulgaris var. **vulgaris** f. **crassicaulis** (Schl. ex A. Br.) R. D. Wood. (**Chara crassicaulis** (Schl. ex A. Br.) Kütz.) Not yet recorded in Scotland but is worth seeking in deep alkaline pools.

Chara hispida var. **hispida**. (**Chara hispida** L. non auct. angl.; **C. aculeolata** Kütz.; **C. polyacantha** A. Br.) is still present in Loch Leven.

Chara globularis var. **aspera** f. **curta** (Nolte ex Kütz.) R. D. Wood. (**Chara curta** Nolte ex Kütz.; **C. desmacantha** (H. & J. Gr.) J. Gr. & B.-W.; **C. aspera** var. **desmacantha** H. & J. Gr.) has been collected in East Fife.

Tolypella nidifica (O. Müll.) A. Br. em. R. D. Wood var. **glomerata** (Desv. in Lois.) R. D. Wood. (**Tolypella glomerata** (Desv. in Lois.) Leonh.) is known from Angus and Fife.

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Society Activities

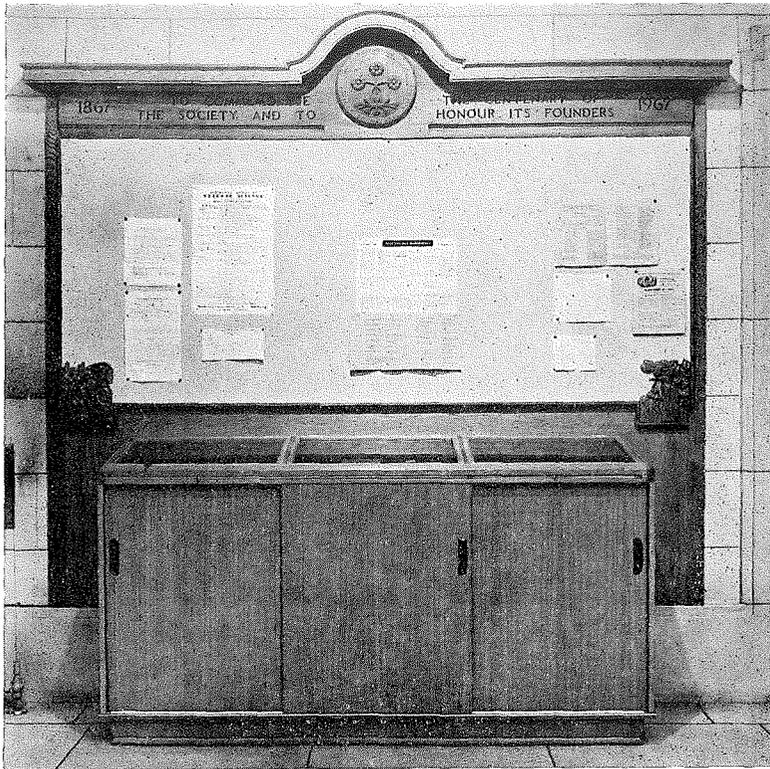
A Hundred Years Old

In August, 1966, the Council met to discuss the coming centenary year of the Society and, through its own efforts and that of two sub-committees during the ensuing months, set in motion a programme of events to mark the historic occasion fittingly both for its members and the citizens of Perth.

On members' night, 23rd February, 1967, a hundred years almost to the day since fourteen naturalists met in a back room in Charlotte Street to formulate the aims of the incipient Perthshire Society of Natural Science, Mr. William Davidson, Curator of the Museum and Art Gallery, presented a short paper on its founding and early years, remembering the names of the eminent men who were its inspiration and its leaders. He retold the story of the first museum built to house the collections of the naturalists who made up its membership then.

The Constitution which had served the Society without amendment since the beginning had been brought up to date in intention and language. Members received draft copies at the Annual General Meeting in March, 1967, and unanimously adopted it as the Constitution of the Society. On the same evening, Dr. W. H. Findlay, President, announced from the chair the plans for the centenary.

It had been proposed to provide a Counter and Notice Board which would simultaneously commemorate the founder members of the Society and be of practical utility in informing members and the general public of its activities to-day. This was to be placed in the entrance hall of the Museum against the south wall adjacent to the door leading to the Lecture Hall. As a considerable proportion of the cost of this work had been guaranteed by an anonymous donor, work on it proceeded during the year. The original drawings were prepared by Mr. T. R. Wood, F.R.I.B.A., of the Burgh Architect's Department; the cabinet work was carried out in Lord Roberts' Workshop, Dundee, and the carving of the Society's emblem, the lettering and decorative panels were the work of Mr. Thomas Heatherwick, Auchterarder, one of Scotland's leading woodcarvers. The whole ensemble strikes a distinctive note



The superscription reads:— TO COMMEMORATE THE CENTENARY OF THE SOCIETY AND TO HONOUR ITS FOUNDERS. 1867-1967.

Photo. Dr. W. H. Findlay

and justifies the efforts of Council members to ensure a dignified and practical design. All honour goes to them and to the craftsmen who made it.

The idea of planting a commemorative grove of trees on that part of Moncreiffe Island north of the railway bridge has also been put into effect. These trees, Scots Pines interplanted with a few Grey Alders and Golden Osiers, will hardly demonstrate the effectiveness of the conception until many years have passed, but when they reach maturity they will add a striking feature to Perth's unique river scene at a point which at present looks bare and unattractive. Looking westwards towards the building in Tay Street which was the original museum and home of the Society, the grove will, moreover, become a permanent reminder to the people of Perth of the Society in their midst. The Town Council of Perth

have fully co-operated in fulfilling these two projects, and thanks are due to that body and to Mr. Davidson. Mr. Lacey, Parks Superintendent, and his staff, who planted and will care for the trees, and Mr. Ian Watt of the Forestry Commission, who selected the seed of the pines, are also due our thanks.

During the summer months of 1967 each of the Sections of the Society acted as hosts at open meetings, demonstrating informally something of their special concerns.

Mr. Tom Weir, the well-known mountaineer, naturalist, writer, and photographer spoke to a capacity audience in the Lesser City Hall, Perth, on Friday, 13th October, 1967, choosing as his subject, "A New Look at Scotland." His lecture was an inspiring overture to the winter syllabus of the centenary year and helped to publicise the work and interests of the Society.

Finally, at the Annual General Meeting in March, 1968, after the official unveiling of the Commemorative Notice Board by Bailie Carter, who deputised for the Lord Provost, Dr. Findlay, after completion of business, delighted his audience by showing a series of slides which illustrated the stages in the manufacture, carving, and assembly of the work. Thus, with a display of excellent photography, ended the hundredth session of the Perthshire Society of Natural Science.

We look to the future.

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