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Greater Glasgow pond amphibian surveys 2022

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ABSTRACT

In 2019, Clyde Amphibian and Reptile Group (CARG) decided to organise a spring 2020 common frogspawn (*Rana temporaria*) survey of the Greater Glasgow area, Scotland. The COVID-19 lockdown postponed this project until 2022. The 2022 survey area was spread across four council districts: Glasgow City, South Lanarkshire, Renfrewshire and East Renfrewshire. The primary aim of the surveys was to collect records of amphibian breeding throughout the Greater Glasgow Area, with secondary aims of: (1) revisiting the ponds to see if the ponds supported the spawn through to tadpole and froglet stages; (2) assessing the condition of the ponds for amphibians; (3) identifying areas for habitat enhancement work; and (4) collecting data on breeding common toads (*Bufo bufo*) and newts (*Lissotriton, Ichthyosaura* and *Triturus* spp.). A total of 45 volunteers participated in the surveys. Surveys were completed between March and May 2022, with a primary focus between March and April in order to capture frog spawning data. Surveyors were asked to record amphibian population data, and habitat data in order to estimate Habitat Suitability Indices. In total 162 ponds were surveyed, with evidence of breeding common frogs found in 66.1% of ponds with 11,478 frogspawn clumps counted on the first set of surveys. Only 12.2% of ponds were found to contain common toads, and small newts (*Lissotriton* spp.) were identified in only 7.4% of ponds. In relation to the quality of breeding habitat, 24.5% of ponds were assessed as drying out annually, which significantly reduces the suitability of these ponds for breeding. This figure is predicted to increase with anthropogenic climate change reducing the number of breeding ponds available to amphibians in the absence of intervention. Furthermore, the majority of the ponds surveyed were assessed as offering poor or below average suitability for great crested newts (*Triturus cristatus*) and nearly half of the ponds surveyed were found to have poor or bad water quality, which can increase stress levels for larval amphibians and may adversely affect mortality levels. However, as the analysis of water quality was subjective, these findings should be treated with caution.

INTRODUCTION

The common frog (*Rana temporaria*) is a common and widespread pool-breeding amphibian found throughout mainland Scotland and many of the islands (McInerny & Minting, 2016). It is regarded as the commonest amphibian in the U.K. (Wilkinson & Arnell, 2013).

In 2019, the Clyde Amphibian and Reptile Group (CARG) organised a spring 2020 frogspawn survey of the Greater Glasgow area. The context for this was that a collaboration between Froglife and Glasgow City Council (2008-13) had led to the creation and/or restoration of 55 ponds on Council land across the city. Some limited assessment of these ponds had been carried out in the intervening years, but no comprehensive survey. The City Council was enthusiastic about CARG's plan. A grant to pay expenses was obtained from Glasgow Natural History Society's Blodwen Lloyd Binns Bequest. The primary aims of the survey were to collect frogspawn records across the Greater Glasgow area, and to provide records for the Glasgow Museums Biological Records Centre (GMBRC). In addition, surveyors were to be asked to collect records of any other amphibian or reptile species that they found in the ponds, including smooth newts (*Lissotriton vulgaris*), palmate newts (*Lissotriton helveticus*), great crested newts (GCN) (*Triturus cristatus*), Alpine newts (*Ichthyosaura alpestris*) and common toads (*Bufo bufo*). A field training course for volunteers was organised for March 2020. However, the COVID-19 pandemic and lockdown intervened. By late 2021, it seemed possible that surveys were safe again. By then, we had learned the ease and usefulness of online training, and we again set about recruiting and training volunteers.

The 2022 survey area included 162 ponds across four council districts: Glasgow City, South Lanarkshire, Renfrewshire and East Renfrewshire. Details of all the pond locations can be found in the Appendix.

The secondary aims of the survey were to:
(1) Revisit the ponds after the initial survey, to determine if the ponds supported the spawn through to tadpole and froglet stages.
(2) Assess the condition of the ponds for amphibians.
(3) Identify areas for habitat enhancement work.
(4) Collect data on breeding common toads and newt species.

METHODS

Training

A total of 45 volunteers participated in the surveys. Surveyors were recruited through online information about the survey distributed to CARG members, Froglife, GNHS members and biological science students at the University of Glasgow. All surveyors were required to join CARG in order to be covered by ARG-UK insurance. Surveyors were provided with the following training:

(1) Two online training sessions using the platform Zoom were held on 20th February and 27th February 2022, which covered amphibian identification, ecology, and the survey techniques that would be implemented (detailed further in Survey Techniques).

(2) A daytime training session was held at Queens Park, Glasgow on 19th March 2022, which provided surveyors with the opportunity to practice the survey techniques, and measurements, in a safe environment.

(3) A night-time training session was held in late March 2022, on amphibian identification through torch surveying: this was held in Calder Glen Country Park, East Kilbride.

Volunteers were provided with the following equipment, when requested: a net for sampling aquatic invertebrates, a copy of OPAL's Freshwater Invertebrate Identification Guide (OPAL, 2015), and an amphibian identification guide. CARG's set of Clulite torches were also made available to any volunteers who wished to complete night-time torch surveys.

Survey techniques

Surveys were completed between March and May 2022, with a primary focus between March and April in order to capture frog spawning data. Surveyors were asked to record amphibian population data, and habitat data when visiting the ponds. For health and safety reasons surveyors were assigned to work in pairs or small groups. Survey pairs/groups were assigned ponds based on their location and transport access. They were encouraged to survey additional ponds where they wished to do so.

Amphibian population data

Surveyors were requested to collect the data outlined in Table 1 during their visits, from bankside visual inspections. Surveyors were instructed not to search for newt eggs due to the destructive nature of searching. Netting for amphibians was discouraged in order to reduce the risk of inadvertent offences being committed by volunteers through disturbance of GCN in ponds.

Habitat data

The survey methodology focused on the collection of data in order to undertake a Habitat Suitability Index (HSI) for each of the ponds visited. The gathering of these data included a mixture of volunteer data collection and desk-based analysis. The breakdown of these elements is detailed in Table 2. The subsequent HSIs were calculated using standard guidance (Oldham *et al.*, 2000) with geographic locations determined based on recent Scottish research (O'Brien *et al.*, 2017). In addition, surveyors were asked to provide any other notes in relation to the pond, its condition, or its surroundings, that they deemed to be relevant to its suitability for amphibians.

Data management

Entry

Volunteers submitted data forms and photographs to CARG. The survey data were then entered into a master Excel spreadsheet. Where data provided by surveyors did not directly correlate with an input for calculating SI values, on a precautionary basis the data were translated to a value which would have a less negative impact on the HSI calculation.

Analysis

HSIs were calculated using formulae input into the master excel spreadsheet using the standard equation

Species	No. of adults	No. of young	Tadpoles & efts (Present or Absent)	No. of spawn clumps/strings	Spawn matt size (m^2)	No. of dead
Common toad (*Rana temporaria*)					N/A	
Common frog (*Bufo bufo*)						
Small newt (unidentified) (*Lissotriton* spp.)				N/A	N/A	
Palmate newt (*Lissotriton helveticus)*				N/A	N/A	
Smooth newt (*Lissotriton vulgaris*)				N/A	N/A	
Great crested newt (*Triturus cristatus*)				N/A	N/A	
Alpine newt (*Ichthyosaura alpestris*)				N/A	N/A	
Others amphibian/ reptile species						

Table 1. Amphibian survey data to be collected.

SI no.	Data type	Description	Collection/determination method
1	Geographic location	The pond's location in relation to the likely presence of GCN (O'Brien et al, 2017) as offering either marginal or unsuitable habitat for GCN.	Ponds were mapped in QGIS over a digitized map detailing the boundaries for the Geographic Location boundaries.
2	Pond area	The size of the pond in m^2.	Pond area estimated by surveyors.
3	Pond permanence	An approximation of the number of years in 10 the pond dries up.	Estimated based on pond conditions and where possible through discussion with local landowners/managers/residents.
4	Water quality	An interpretation of the quality of the water based on invertebrate diversity, presence of plants, and understanding of water sources.	Water quality determined by surveyors; where possible (and safe to do so) sampling water via netting to establish an understanding of the invertebrate species present.
5	Shade	Percentage of pond perimeter shaded to at least 1m from the shore.	Estimated by surveyors.
6	Waterfowl effect	An interpretation of the impact of waterfowl on the pond.	Determined by surveyors.
7	Fish presence	An interpretation of the likely fish presence in the pond.	Determined by surveyors.
8	Pond density	Number of ponds within 1km of the pond.	Pond density calculated using MagicMap (DEFRA, 2022)
9	Terrestrial habitat connectivity	Assessment of the suitability of habitat within 500 m of the pond in providing terrestrial commuting and foraging habitat for amphibians.	Determined by surveyors.
10	Macrophyte cover	Percentage of pond covered by macrophyte vegetation.	Coverage estimated by surveyors.

Table 2. Data for Habitat Suitability Index (HSI) completion.

(Oldham *et al*., 2000), and frogspawn mat sizes were converted to number of spawn clumps (Griffiths *et al*., 1996). Data were reviewed for correlations through Excel, and then potential correlations were tested for significance using univariate analysis in SPSS. Survey data for frog tadpoles, newt efts and newt eggs were analysed in relation to their presence/absence; otherwise, data were analysed using the recorded abundances.

Limitations

As the surveys were predominantly bankside visual surveys throughout March and April, it is considered probable that newt presence has been under-recorded, as these are often best detected through night-time torch surveys, or through netting. In addition, common toads breed later in the year than frogs, and as only a small number of night-time surveys were completed, the number of ponds used by breeding common toads is anticipated to have been under-recorded.

Grid references were not collected for all ponds, and whilst this may make it more difficult to revisit some ponds, the general area of the ponds is known so it has not impacted on the ability to complete the HSIs.

Surveyors did not always complete all aspects of the form, so the volume of data collected differed across criteria. However, for the majority of ponds, information on all factors was recorded, and as such it is considered there is still a sufficient dataset to interpret trends.

RESULTS

Amphibian population results

Evidence of breeding common frogs was found in 99 ponds (61.1% of ponds surveyed). A breakdown of how this is split across the visits can be found in **Error! Reference source not found.** Only 20 ponds were found to contain common toads (12.2% of total), in which four were identified as having toad spawn, and five where toads were identified through the presence of toad corpses adjacent to the ponds. Small newts were identified in a mere 12 ponds (7.4% of total), as adult palmate newts, unidentified small newts or newt efts, and in one instance, newt eggs.

Habitat Data

Habitat suitability indices

Insufficient data were gathered to calculate HSIs for 11 of the surveyed ponds: notes provided by surveyors indicate that six of these ponds were dried out at the time of survey.

The HSI results band ponds based on their perceived suitability for GCN as offering between "Poor" and "Excellent" suitability. The banding of the surveyed ponds, for which sufficient data were collected is detailed in Table 4. Where a pond obtained different HSI scores across different visits, on a precautionary basis the worse of the two HSI scores has been used.

Drying out frequency
The approximate drying out frequency of the 151 assessed ponds is detailed in Table 5.

Water quality
The water quality was recorded for 151 of the surveyed ponds and is described in Table 6.

Environmental factors vs. observed amphibian presence
Univariate analysis that identified links between environmental variables and observed amphibian presence is summarised in Table 7.

	Visit 1	Visit 2	Visit 3
No. of ponds visited	162	29	2
No. of clumps of spawn	11,478	452	0
No. of ponds with clumps of spawn	97	7	0
No. of ponds with tadpoles	23	1	1
Mean no. clumps of spawn (visited ponds)	70.85	15.59	N/A
Mean no. clumps of spawn (only ponds with spawn)	118.33	64.57	N/A
No. of ponds showing evidence of breeding	98	8	1
% of visited ponds showing evidence of breeding	60.49%	27.59%	50%

Table 3. Evidence of breeding common frogs (*Rana temporaria*).

Suitability assessment	No. of ponds	Percentage of assessed ponds
Poor	67	44.4
Below Average	27	17.9
Average	25	16.6
Good	27	17.9
Excellent	5	3.3
Total	**151**	**100**

Table 4. Pond suitability for GCN.

Category	Drying out frequency	No. of ponds	Percentage of surveyed ponds
Never dries	Never dries	54	35.8
Rarely dries	Dries no more than two years in ten or only in drought	21	13.9
Sometimes dries	Dries between 3 years in ten to most years.	39	25.8
Dries annually	Annually	37	24.5
Total		**151**	**100**

Table 5. Drying out frequency of surveyed ponds.

Water quality	No. of ponds	Percentage of surveyed ponds
Bad	4	2.6
Poor	63	41.7
Moderate	54	35.8
Good	30	19.9
Total	**151**	**100**

Table 6. Water quality of surveyed ponds.

DISCUSSION

Frogs

Larger ponds were found less likely to have observable tadpoles than smaller ponds ($P < 0.05$). This may be due to the reduced percentage of the large ponds being observable from the bank.

Ponds which did not regularly dry out were statistically found to be more likely to contain frogspawn ($P < 0.05$), and also contained higher amounts of frogspawn. In addition, there was a possible but not statistically significant linkage ($P < 0.10$) between the permanence of ponds and the number of adult frogs observed, with more adult frogs being observed in more permanent ponds.

Water quality was observed to have linkages with survey findings: however, a note of caution should be made here as the assessment of water quality was subjective, and made by a range of surveyors. There may be a linkage ($P < 0.10$) between water quality and the number of spawn clumps identified in a pond, with higher water quality ponds containing more spawn clumps (Fig. 1). It should be noted that this trend relates to observed spawn. It cannot be ruled out that higher amounts of spawn were in the polluted ponds pre-survey, and that this died at an early stage, resulting in a reduced amount of observable spawn. Ponds with better water quality were more likely (P <0.05) to have dead frogs observed at them. However, as only 12 ponds were found with dead frogs, this link should be treated with caution.

	Adults				**Juveniles**		**Eggs**			**Dead**	
HSI Category	**Common frog**	**Common toad**	**Small newt**	**Palmate newt**	**Common frog**	**Small newt**	**Common frog**	**Common toad**	**Small newt**	**Common frog**	**Common toad**
Geographic location											
Pond area					+						
Pond permanence	?	?	+				+				
Water quality			+	?			?		+	+	
Shade	?										
Waterfowl											
Fish					+					+	+
Pond density		?					?				
Terrestrial habitat							+				
Macrophyte cover				?							
Overall HSI			+					?			

Table 7. Summary table of univariate linear models: relationships between HSI categories and common frog (*Rana temporaria*), common toad (*Bufo bufo*) and newt (*Lissotriton* spp.) lifestages. Plus signs indicate statistically significant linkage (P <0.05), and question marks possible but not statistically significant linkages (P <0.10).

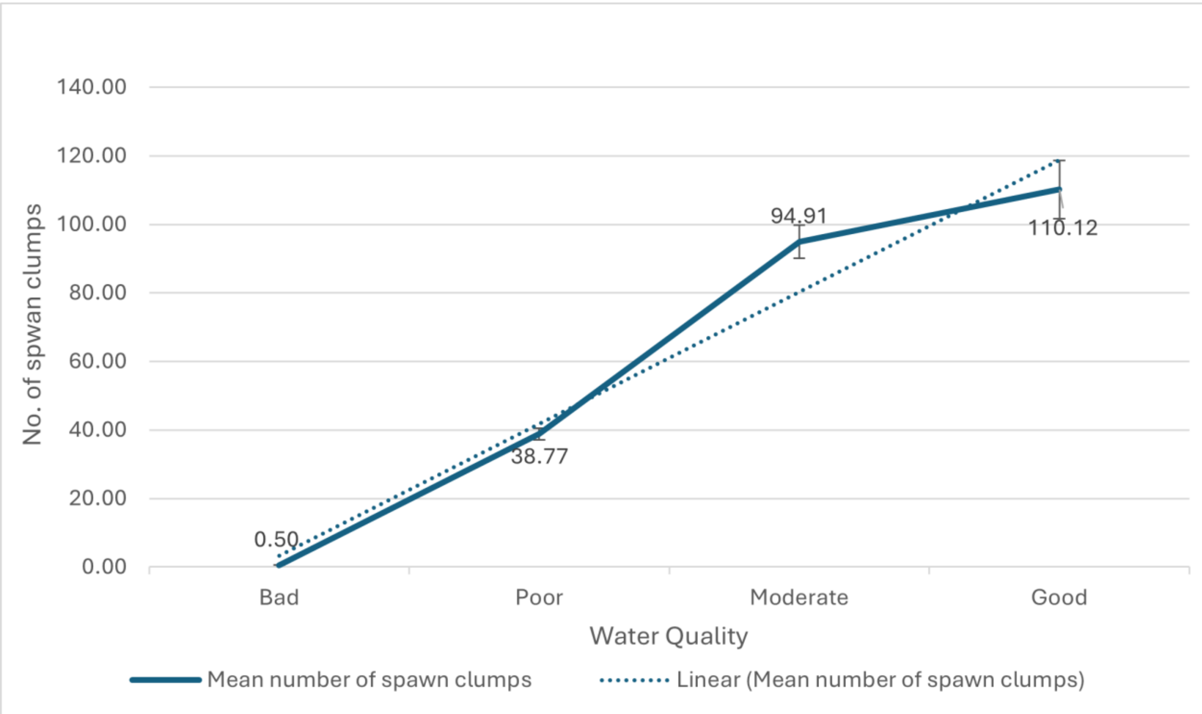

Fig. 1. Relationship between water quality and number of common frogspawn (*Rana temporaria*) clumps.

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There was a possible but not statistically significant positive correlation (P <0.10) between shade and number of adult frogs. Fewer dead frogs were observed around ponds with higher fish populations (P <0.05), and tadpoles were more likely to be observed in ponds with smaller fish populations (P <0.05). There may be a link (P <0.10) between pond density and the amount of frogspawn present in a pond, with higher amounts of spawn found in ponds which were surrounded by greater number of ponds. As the quality of terrestrial habitat increased (P <0.05), the amount of spawn found in ponds increased. This is likely due to the habitats surrounding the pond being able to support a higher number of frogs in their terrestrial life stages. The data did not reveal a significant correlation between HSI category and number of spawn clumps (P >0.10) (Fig. 2). The existence of such a correlation is plausible as many of the factors that affect the suitability of a pond for GCN will also affect its suitability for common frog breeding, such as surrounding habitat types, proximity to other waterbodies, and the presence/absence of fish and waterfowl.

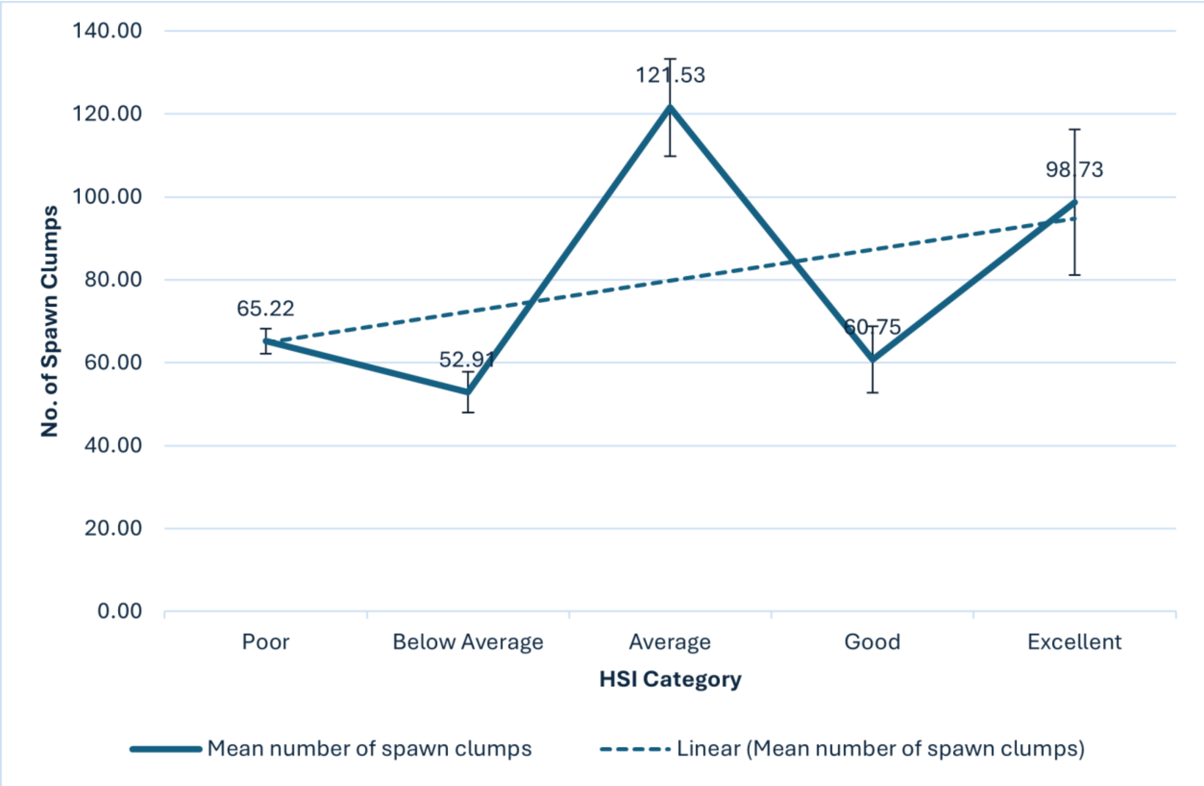

Fig. 2. Relationship between HSI Category and number of common frogspawn (*Rana temporaria*) clumps.

Insufficient temporal data were collected to draw meaningful conclusions, with only 25 ponds visited twice, and two visited three times. It is recommended in future years that an increased emphasis is placed upon surveyors completing monthly visits to ponds, in order to gain a further understanding of survival of the spawn progression into tadpoles and on to metamorphosis.

Common toads and newt species

As common toads were recorded at only 20 and newts at only 12 of the surveyed ponds, the sample sizes are too small to make any meaningful inferences, despite statistical linkages. We recommend that torchlight surveys are undertaken in future years throughout the amphibian breeding season. However, where this is not possible for health and safety reasons (for example due to the risk of antisocial behaviour), then daytime netting of ponds could be undertaken (Froglife, 2001). However, this will not be suitable for ponds containing aquatic invasive species such as New Zealand stonecrop (*Crassula helmsii*) and water fern (*Azolla filiculoides*), and surveyors would be required to be trained in their identification. Alternatively, eDNA analysis of ponds could be undertaken; if completed in May, this would be within the optimal period for capturing sloughed cells of all of the U.K.'s breeding amphibian species. However, this would require significant expenditure, and does not provide abundance data.

Habitats

The majority of the ponds surveyed (62.2%) were assessed as offering poor or below average suitability for GCN. Whilst this does not directly translate to any indices of habitat quality for other native amphibian species, all of the elements that are considered for GCN will also affect the suitability of ponds for other amphibian species, although there is now evidence to suggest additional abiotic factors need to be considered in assessing the suitability of ponds in Scotland for GCN (Harper *et al.*, 2019)

Nearly half of the ponds surveyed (44.4%) were found to have poor or bad water quality, which can increase stress levels for larval amphibians such as common frogs (Strong *et al.*, 2017), and may adversely affect mortality levels. However, as noted previously, the analysis of water quality was subjective, so these data should be treated with caution.

Nearly a quarter of ponds were assessed as drying out annually (24.5%). This significantly reduces the suitability of these ponds for breeding. Whilst amphibians such as frogs may spawn in them, if the ponds dry out over the summer months, then juvenile amphibians will die before making it through metamorphosis to terrestrial life stages. A further 25.8% of ponds were assessed as sometimes drying out (between 3 years in 10 and most years). Whilst occasional drying out can benefit amphibian populations in ponds by leading to a reduction of predators, as the frequency of the ponds drying out increases, amphibian breeding success suffers. With the effects of anthropogenic climate change it is likely that without intervention the frequency of pond drying out will increase, and more ponds will dry out sometimes or annually, thus reducing amphibian recruitment.

CONCLUSION

The survey succeeded in its primary aim of collecting records of breeding amphibians around the greater Glasgow area. These data have been submitted to Clyde ARG and, following some tidying up, will be shared with GBMRC in early 2024. For future surveys, it is recommended that a recording form is used which more closely aligns with GMBRC's data entry form in order to streamline data submission.

The surveys succeeded somewhat in their goal of undertaking condition assessments for amphibians, with 151 ponds being condition assessed for GCN. It is acknowledged that this does not directly translate to an index of habitat quality for other native amphibian species, and that additional abiotic factors need to be considered in assessing the suitability of ponds in Scotland for GCN (Harper *et al.*, 2019). However, in the absence of an alternative rapid methodology, HSI does provide a rapid approximation which volunteers can easily learn to complete.

Only a small proportion of ponds was revisited, and therefore only limited data on the success of amphibian reproduction were gathered. In addition, only a small number of night-time surveys were undertaken identifying breeding newt species and common toads. This is considered likely due to a lack of capacity by the survey co-ordinators to continually liaise with surveyors throughout the survey season due to other commitments, and it is therefore recommended that if the survey is repeated in future years, dedicated resource is provided towards undertaking the surveys.

A review of the dataset indicates numerous ponds that have dried out and may be in need of habitat enhancement work. These data have not been reviewed in detail due to a lack of capacity, but will be made available in the complete, anonymised data set.

The surveys have provided a valuable glimpse into the health of the ponds around Glasgow. However, the condition of ponds can change considerably from year to year (Paterson, 2016). It is therefore recommended that the surveys are repeated in future years in order to gain a wider understanding as to the health of ponds within the Greater Glasgow area and their recruitment success for amphibians.

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APPENDIX

[1]Pond names were assigned by volunteers. Occasionally for clarity, references have been added when sites are within Nature Reserves or Country Parks. Any gaps in numbering indicate a pond that was intended to be surveyed but for which no data were gathered.

[2]Due to calculations associated with assessing the number of clumps in a common frogspawn (*Rana temporaria*) matt (Griffiths *et al.*, 1996), where the total number of clumps records a partial clump (e.g. 78.27) the total number of clumps has been rounded down to the nearest whole number.

Pond name[1]	Nat. Grid Ref.	Max. no. frogspawn clumps counted[2]
Barshaw Park, Paisley - Large Pond	NS4996564265	0
Barshaw Park, Paisley - Small Pond	NS5004564265	292
Bingham's Pond	NS5540068300	45
Boylestone Quarry, Barrhead	NS4920559715	171
Brownside Farm	NS4854560855	2
Cardowan Moss 02	NS6563167218	0
Cardowan Moss 03	NS6504867376	83
Cardowan Moss 05	NS6543067194	116
Cardowan Moss 06	NS6597467149	0
Cardowan Moss 07	NS6600067149	0
Cardowan Moss 08	NS6606467071	97
Cardowan Moss 09	NS6589367089	0
Cardowan Moss 10	NS6588867073	0
Cardowan Moss 11	NS6550167475	0
Commonhead Moss 01	Not provided	80
Commonhead Moss 02	NS6970066000	117
Commonhead Moss 03	Not provided	75
Commonhead Moss 04	Not provided	89
Commonhead Moss 05	Not provided	38
Crossroads (Trig Point) Pond	NS4500060537	0
Darnley Country Park (CP)	NS5260358919	75
Darnley CP - Extra Pond 01	NS5269259003	0
Darnley CP - Extra Pond 02	NS5246058553	46
Dawsholm Park 01	NS5563069670	74
Dawsholm Park 02	NS5573069720	0
East Kilbride (EK) 03 - Calderglen CP Bottom Field	NS6547152886	149
EK04 – Calderglen CP Fire Pond	NS6541852863	4
EK05 – Calderglen CP Old Duck Pond (Lower)	NS6524252636	78
EK06 – Calderglen CP Old Duck Pond (Upper)	NS6523752630	113
EK07 – Calderglen CP Wildlife Pond	NS6551652660	18
EK08 – Calderglen CP Fred 's Pond	NS6584754715	59
EK09 - Glen Esk Marsh	NS6550054981	73
EK10 - Greenhills Road Substation	NS6422651942	0
EK11 - Hairmyres Woods	NS6053354486	22
EK13 - Langlands Amphibian Pond 01	NS6318551353	0
EK14 - Langlands Amphibian Pond 02	NS6321651379	0
EK18 - Redwood 01	NS6020154565	48
EK19 - Redwood 02	NS6027154595	5
East Kilbride (EK) Bonus 01	NS6412951090	62
EK Bonus 02	NS6411251088	18
EK Bonus 03	NS6410851076	25
EK Bonus 04	NS6404251136	60
EK Bonus 05	NS6408651253	17
EK Bonus 06	NS6426751954	41
EK Bonus 07	NS6344651738	19
Fereneze Golf Course Pond, Barrhead	NS4896059640	57
Glassford Bridge	NS7331345421	10
Glassford Pond	NS7311847051	149
Glen Moss Pool 03	NS3687269639	0
Glen Moss Pool 04	NS3690069650	1
Glen Moss Pool 05	NS3674169613	0
Glen Moss Pool 06	NS3700069880	0
Glen Moss Pool 07	NS3692069850	0

Pond name[1]	Nat. Grid Ref.	Max. no. frogspawn clumps counted[2]
Hamiltonhill Claypits LNR: Canal Basin	NS5836267499	0
Hamiltonhill Claypits LNR: Claypit Pond	NS5824867937	0
Harelaw Reservoir	NS4847059780	299
Harelaw Reservoir Pond	NS4865059580	146
Holmhills Wood LNR Long Pond	NS6400059610	227
Holmhills Wood LNR Main Pond	NS6391059650	126
Holmhills Wood LNR Square Pond	NS6394059700	81
Hurlet Hill 01	NS5157061461	43
Hurlet Hill 02	NS5155261481	75
Hurlet Hill 03	NS5143861523	132
Hurlet Hill 04	NS5142761513	85
Hurlet Hill 05	NS5141361500	289
Hurlet Hill 06	NS5140661555	0
Hurlet Hill 07	NS5158461458	1509
Hurlet Hill 08	NS5142461494	0
Hurlet Hill 09	NS5141261493	0
Jack's Pond, Brownside, Paisley	NS4854260863	38
Jenny's Well LNR A	NS4993062840	1
Jenny's Well LNR B	NS4990062820	4
Jenny's Well LNR C	NS4992062820	52
Jenny's Well LNR D	NS4991062830	1
Jenny's Well LNR E	NS4991062820	0
Langlands 01	NS6412951090	62
Langlands 02	NS6411251088	18
Langlands 03	NS6410851076	25
Langlands 04	NS6404251136	60
Langlands 05	NS6408651253	17
Langlands 06	NS6426751954	41
Langlands 07	NS6344651738	19
Langlands Industrial Estate	NS6412951090	62
Lethame Pond	NS6861044619	1711
Linwood Moss Puddle	NS4394065670	49
Lochwinnoch RSPB - LH Pond	NS3594058120	0
Lochwinnoch RSPB - Path end Puddle	NS3658058710	31
Lochwinnoch RSPB RH Pond	NS3505058000	0
Maxwell Park	NS5659462947	21
Muirshiel CP Ditch	NS3136863150	11
Muirshiel CP Lower	NS3126063140	0
Muirshiel CP Middle	NS3131563162	9
Muirshiel CP Upper	NS3126063210	92
Nether Lethame Duck Pond	NS6857344943	70
Newlands Park	NS5705960604	0
Pedmyre 01	NS5949057890	15
Pedmyre 02	NS5951057680	0
Pedmyre 03	NS5939057570	16
Pedmyre 04	NS5932057550	19
Pedmyre 05	NS5933057530	0
Pedmyre 06	NS5926057570	0
Pedmyre 07	NS5931057620	24
Pedmyre 08	NS5939057950	38
Pedmyre 09	NS5942057930	12
Pedmyre 10	NS5937057560	28
Pedmyre 11	NS5936057540	184
Pedmyre 12	NS5934057540	38
Pollok CP 01	NS5550062600	6
Pollok CP 02	NS5530061500	780
Provanhall	NS6676966244	0
Queens Park Duck Pond	NS5769862318	224
Roaden Burn Pond	NS4583561059	20
Robroyston LNR 01	NS6270068400	140
Robroyston LNR 02	NS6281368102	50

Pond name[1]	Nat. Grid Ref.	Max. no. frogspawn clumps counted[2]
Robroyston LNR 03	NS6281368102	1511
Robroyston LNR 04	NS6271468730	0
Robroyston LNR 05	NS6289568414	0
Rosshall Park Pond	NS5210863127	0
Seven Lochs 1 (Hogganfield LNR)	NS6424566910	59
Seven Lochs 2 (Hogganfield LNR)	NS6451867178	23
Seven Lochs 3 (Hogganfield LNR)	NS6471367262	0
Seven Lochs 4 (Hogganfield LNR)	NS6467067291	0
Seven Lochs 5 (Hogganfield LNR)	NS6464767295	0
Seven Lochs 6 (Hogganfield LNR)	NS6462767301	0
Seven Lochs 7 (Hogganfield LNR)	NS6460567322	0
Strathaven Park	NS6695644871	418
Windlaw 01	NS6039158070	0
Windlaw 02	NS6034958057	0
Windlaw 03	NS6033458070	0
Windlaw 04	NS6034957988	0
Windlaw 05	NS6025357904	0
Windlaw 06	NS6022357903	0
Windlaw 07	NS6018957902	0
Windlaw 08	NS6018357939	0
Windlaw 09	NS6023157953	0
Windlaw 10	NS6020057900	0
Windlaw 11	NS6020057900	0
Windlaw 12	NS6025157941	0
Windlaw 13	NS6029457974	0
Windlaw 14	NS6031257901	0
Windlaw 15	NS6040157811	0
Windlaw 16	NS5984258104	1
Windlaw 17	NS5961358040	3
Windlaw 18	NS5970358022	1
Windlaw 19	NS5957357994	0
Windlaw 20	NS5966657995	41
Windlaw 21	NS6037657836	0
Windlaw 22	NS6043657797	3
Windlaw 23	NS6039958120	0
Windlaw 24	NS6059157999	0
Windlaw 25	NS6056458019	1
Windlaw 26	NS5989858183	0
Windlaw 27	NS6063158018	0
Windlaw 28	NS6033657974	0
Windlaw - Bonus 1	NS5962058040	19
Windlaw - Bonus 2	NS5955057910	5
Windlaw - Bonus 3	NS5957057910	0
Windyhill, Johnstone Puddle 01	NS4353761235	107
Windyhill Puddle 02	NS4353161235	3
Windyhill Puddle 03	NS4344761231	0
Windyhill Puddle 04	NS4344761231	0
Windyhill Puddle 08	NS4361661205	2