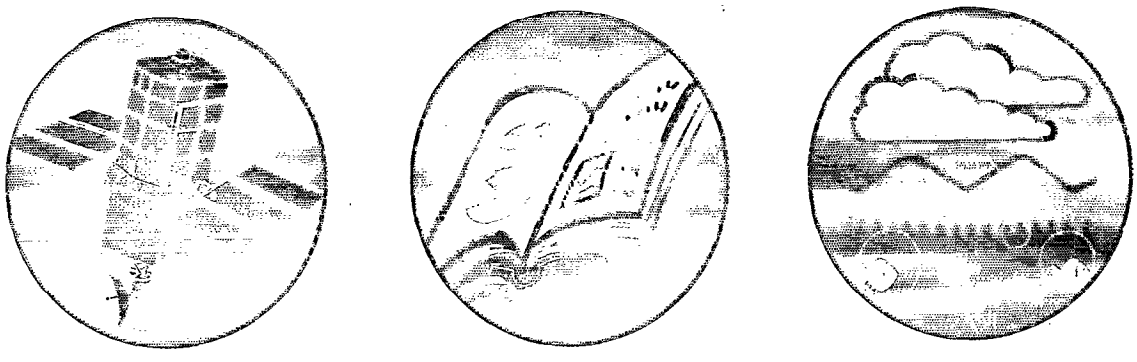
The Impact of Lost and Discarded Fishing Line and Tackle on Mute Swans - Phase 1



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The Impact of Lost and Discarded Fishing Line and Tackle on Mute Swans - Phase 1

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i) simple guidelines for anglers;

ii) tackling issues at known 'blackspots' to reduce the impact at these sites

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CONTENTS

THE IMPACT OF LOST AND DISCARDED FISHING LINE AND TACKLE ON MUTE SWANS - PHASE 1

SUMMARY

1 This report presents findings from a preliminary scoping study to establish the extent of the problem of tackle-related injuries to mute swans. Data from a number of swan rescue groups collected in 1996 were used for analysis.

2 Other sources of information have been used to determine changes in the mute swan population and the incidence of lead poisoning.

3 There are significant uncertainties and assumptions in interpreting the available data. Nevertheless, some broad conclusions can be made:

- the mute swan population nationally has increased significantly since 1978;
- the restriction on lead fishing weights imposed through byelaws in 1987 has significantly reduced the frequency of lead poisoning in mute swans nationally - however, there are still some local incidences of lead poisoning which are being investigated further;
- data on swan rescues have been very difficult to analyse in a consistent fashion because individual swan rescue groups recorded incidents in different ways;
- tackle-related injuries are the biggest single cause of swan rescues;
- the biggest proportion of angling-related rescues occur between July and September, coincident with both the school holidays and a surge in swan numbers due to the appearance of young inexperienced cygnets;
- the survival rate of rescued swans is very high, underlining the effectiveness of swan rescue groups;
- nationally, it is estimated that there are at least 2000 tackle-related swan rescues per year - the estimated cost to the voluntary swan rescue groups, excluding labour is £134k;
- experimental voluntary segregation of anglers and swan-feeding areas has been shown to be effective in reducing tackle-related injuries.

4 As a result of this project, a standard recording form has been developed for more consistent recording of swan rescues. In addition, a computerised database of swan rescue incidents has now been established.

1 INTRODUCTION

Recent changes in fisheries byelaws have raised concerns about possible increased impact of angling on aquatic wildlife. In particular the removal of the coarse fish close season on most stillwaters and the introduction of a maximum four rod limit for coarse fishing have given rise to concern that tackle related injuries among birds and mammals may increase. The purpose of this project was to establish the current extent of fishing tackle-related injuries. The original intention was to examine tackle related incidents for all wildlife, but almost all of the available data relates to mute swans *Cygnus olor*, so this report concerns only the impact on them.

In the 1970s and 1980s lead poisoning was identified as a problem in mute swans, with one of the main reasons being from ingestion of lead fishing weights. As a result, byelaws restricting the use of certain sized lead fishing weights were introduced by Regional Water Authorities in England and Wales during 1987. Fishing tackle manufacturers and anglers responded well to these restrictions and the incidence of lead poisoning in swans has fallen dramatically in most areas over the last 10 years.

1.1 Context

Problems concerning swans and angling have been known for some time. Many mute swans are very tame and are accustomed to being fed bread by members of the public. As a result they frequently approach anglers and if the opportunity arises, may take the bait and become hooked. Other birds become entangled by swimming through the line or becoming caught up with lost or discarded tackle.

1.1.1 Changes in mute swan numbers

There has not been a national swan census since 1990 and that census has not yet been fully analysed. However, a preliminary report showed that *"the British population has increased dramatically since 1986/87"* (Kirby *et al* 1994). Some figures were also given in Delany *et al* (1992) for the full surveys for England; these were: 1978 (13,340), 1983 (14,800) and 1990 (20,000); the increase between 1983 and 1990 was therefore around 35%. Although no national figures are available since 1990, some local populations have continued to increase.

At least three factors may account for the change in fortunes: (i) the reduction in lead poisoning; (ii) the increase in the number of rescue services which deal with sick and injured swans; and (iii) the recent run of mild winters. Swans, especially cygnets, survive less well in cold than in mild winters (Perrins, 1991).

1.1.2 River water quality

Between 1990 and 1995 there was a net overall improvement in water quality over 9100 km of rivers and canals in England and Wales. Biological Oxygen Demand (BOD) from sewage treatment works decreased overall by 26%, and ammonia by 37% (Environment Agency, 1998). Phosphate loads also declined due to better treatment and a reduction in its use in detergents. It is difficult to assess the impact of these changes since swans are

very mobile and able to avoid polluted areas. Nevertheless, improvement in water quality is likely to have been a factor contributing to the rising mute swan population.

1.1.3 River flows

Many rivers have suffered from drought and over-abstraction in recent years. Low river flows may degrade habitat, but are often associated with increased aquatic plant growth. The impact of low flows on swan populations is therefore difficult to assess.

1.1.4 River traffic

Boat traffic is known to impact on physical habitat and aquatic macrophytes (Staples, 1992). It is therefore likely that intense boat traffic may have an adverse impact on the swan population. Data for the River Thames shows that boat registrations and boat movements have declined in recent years. Lockages on the Thames fell from a peak of 456,000 in 1980 to 356,000 in 1992, with a subsequent slight upturn to 381,000 in 1997. Registrations of powered craft on the Thames has declined over the past ten years - from 11,521 in 1987 to 9,640 in 1997. This does not necessarily reflect boat traffic nationally, but given that most of the recorded tackle incidents involve swans in the Thames area, it is reasonable to view the increase in swan population against a background of declining boat traffic.

1.1.5 Angling

A national survey of anglers carried out in 1994 indicated that there are about 3 million anglers aged 12 or over in England and Wales (NRA, 1995). This represented a rise in coarse and game anglers compared with previous surveys in 1970 and 1980. However, since the data were collected in a different way the report could not draw firm conclusions about the changes in numbers.

The 1994 survey highlighted changes in anglers' habits, notably:

- an increased preference for stillwater fishing;
- a switch in the most popular species among coarse anglers from roach to carp;
- an increase in "pole" fishing among coarse anglers.

The most significant recent change has been the removal of the statutory coarse fish close season on most stillwaters since 1995. Coarse angling activity on ponds, lakes and reservoirs has therefore increased during the swan breeding season (March - July) and this will have increased the potential for interaction between anglers and young, inexperienced cygnets, notably towards the end of this period.

1.1.6 Habitat

Whilst there has been a significant decline in the number of farm ponds in recent decades (Williams *et al.*, 1998), this in unlikely to have influenced the swan population because most would be too small for breeding pairs to establish territories. In contrast, the increase in the number of gravel pits and purpose-built stillwater coarse and trout fisheries has probably contributed significant extra habitat which is suitable for swans.

Degraded river habitat has been of concern in recent years, and there have been numerous projects carried out by the Agency and others towards restoring river habitat (River Restoration Centre, 1998). In some cases these will have benefited swans and other water birds, but there is currently no meaningful measure for assessing overall improvement of swan habitat.

2 METHODS

2.1 Scope, quality and availability of the data

This report summarises the preliminary analysis of data made available by a number of swan rescue groups operating under the aegis of The National Convention for the Welfare of Swans and Other Wildlife. The bulk of the data analysed relates to rescues carried out in 1996, and involved essentially only swans. Some data from 1997 have been analysed to highlight specific issues.

The data from nine of these groups was recorded on a form which had been drawn up specifically for this purpose by members of The Convention. The other two groups used their own style of reporting. One group (Hampton Swan Rescue) submitted a quantity of additional information relevant to that particular part of the River Thames to the west of London.

The data submitted were entered onto a new Swan Rescue Incident database, at the Edward Grey Institute of Field Ornithology, Oxford University. Since a number of data fields on the report forms were not completed, these remain blank in the database.

The available data are biased geographically towards south-east England - exacerbated by the fact that almost two-thirds of the 1996 records come from Swan Life-Line, based at Windsor, whilst many others come from Hampton Swan Rescue whose rescues are almost exclusively from the River Thames.

3 RESULTS

3.1 Types of incidents

Table 1 gives the causes for call-outs to the swan rescue groups. It is important to emphasise that these figures represent a **sample** of the total national incidents, and only those represented by the rescue groups which provided the data. In some instances a rescue group will attend a call-out for a dead swan, but often it is not possible to determine the precise cause of death, nor is a cause always reported.

3.2 Cause of injuries

In most cases, tackle injuries seem to be correctly reported, although it is possible that injuries classified in other categories may have been tackle-related. It is assumed that birds recorded simply as "injured" were not injured by tackle. Other sources of uncertainty include the possibilities that some "sick" swans may be suffering from lead poisoning whilst some "dead" birds *may* have died as a result of fishing tackle.

Table 1: Numbers of swan rescue incidents (1996)

Problem	January to March 14	March 15 to June 15	June 16 to August	September to December	TOTAL
Tackle	58	62	336	225	**681**
Grounded	51	28	27	130	**236**
territorial dispute	44	43	59	83	**229**
dead	35	30	38	57	**160**
illness/poor condition	44	20	27	66	**157**
injury	40	26	39	47	**152**
lead poisoning	37	16	40	29	**122**
pollution	19	18	14	25	**76**
collision	16	10	14	35	**75**
wandering	3	15	15	18	**51**
frozen in ice	28	0	0	11	**39**
botulism	2	2	20	11	**35**
trapped	5	6	9	14	**34**
abandoned	1	2	24	6	**33**
swept over weir	0	13	14	3	**30**
self-admitted	5	2	0	13	**20**
re-location	1	5	6	6	**18**
vandalism	2	4	6	2	**14**
predator attack	3	2	3	5	**13**
shot	1	4	4	2	**11**
leg ring problem	1	3	1	1	**6**
Miscellaneous	10	12	34	18	**74**
TOTAL	**406**	**322**	**731**	**807**	**2266**

Tackle injuries remain by far the single most important category of all swan rescue call-outs (30%). Although there is some regional variation, this pattern seems to be true for all rescue group data. The highest level was at Evesham (46%), whilst the lowest was at Barry, where only one out of 31 swans rescued was reported as having been a tackle injury, although in this instance all the remaining birds were rescued from ice in January.

3.3 Seasonal pattern of tackle injuries

Table 2 shows the seasonal pattern of tackle injuries. The year is sub-divided into unequal parts in order to distinguish the coarse fish close season on rivers.

The highest incidence of tackle-related injuries (as a percentage of the rescues) and the highest actual number of rescues due to tackle occur in the summer months. It is significant that July and August are in the school summer holidays when casual and inexperienced young anglers are most likely to be fishing. Late June is the time of year with longest evenings when many people go to fish after work hours. These factors, plus the upsurge in swan numbers caused by broods of cygnets, mean that the opening of the fishing season on rivers is always a very busy time for the rescue groups. Numbers of incidents are lower at the end of the year and remain low until after the close season.

There is a statutory close season for coarse fishing on all rivers during the period March 15 to June 15 inclusive. It might be expected that a reduction in the number of tackle related incidents would occur during that period. Although the numbers are lower, the **percentage** of injuries due to tackle is similar to that in the early part of the year. Since 1995 there has been no statutory coarse fish close season on most still waters, and this may explain the continuation of tackle-related incidents through the spring. To investigate this further, the data have been analysed further, dividing tackle-related incidents into river or lake-related habitats (Table 3). The sample is much smaller because many records did not include information about the habitat. However, despite this, the data do not show a higher proportion of tackle injuries recorded from lakes during the close season period on rivers. It should not be assumed that all incidents in rivers during the close season result from illegal fishing, since birds may become entangled in discarded tackle which has been around for some time. Also, birds move between rivers and lakes. Game fishing also takes place during this period, but preliminary evidence suggests that, by far, most injuries arise from coarse fishing.

Table 2. The frequency of tackle-related swan rescues by time of year in 1996

	Total rescues	No tackled	% tackled
1 January - March 14	406	58	14.3
March 15 - June 15	**322**	**62**	**19.3**
June 16 - 31 August	731	336	46.0
1 September - 31 December	807	225	27.9

Table 3. The number of angling-related rescues by time of year and habitat in 1996			
	Lake	River	% from lakes
January - March 14	17	24	41.4
March 15 - June 15	**13**	**22**	**37.1**
June 16 - August	65	200	24.5
September - December	43	133	24.4
Note: Lake includes, ponds, gravel pits etc. River includes broads, canals.			

3.4 The fate of rescued birds

For a more complete picture, data from 1996 and part of 1997 have been used to establish the fate of tackle-injured swans which have been rescued (Table 4).

Table 4. The fate of swans rescued because of tackle-related injuries. January 1996 - July 1997.		
Outcome	***n***	**%**
Detackled on site (bankside)	299	49.6
False alarm/detackled itself	82	13.6
Released later	147	24.4
Still in care	45	7.5
Not recorded (? Still in care)	20	3.3
Died	10	1.7
TOTAL	**603**	**100**

The results are encouraging, with only 10 of the 603 (or 521 if one excludes the "false alarm/detackled itself" category) of these birds having died. This also assumes that all bankside de-tackling is successful. Given that some of the birds would certainly have died had they not been rescued, this gives some indication of the effectiveness of the swan rescue groups.

3.5 Treatment of tackle injuries

Records show quite a high proportion of de-tackles are dealt with *in situ*; hooks attached to the 'outside' of a bird can usually be removed relatively easily. Only in the case of

more serious injury when veterinary expertise is needed is the bird removed (see Table 5). If deemed fit, young birds - cygnets or juveniles - can be returned to their families within two days without undue fear of rejection by the parents.
In more difficult cases, there appears to be no consistency of approach; it cannot be known for certain if a hook(s) have been swallowed and, if so, where the hook is. Only an x-ray investigation will resolve this. In some case, this is the approach adopted, while in others, the line is simply cut, and the swan is released. The long term effect of this later course of action cannot be known at this stage, although to date no ill effects have been seen in swans so treated on the Thames at Hampton.

Table 5. Hampton Swan Rescue Group treatments	
Number of swans rescued	173
Number with hook in mouth/bill etc.	101
Number taken to vet	5
Number from which all tackle removed	54
Number from which some tackle not removed	42

3.6 Frequency of tackle injuries

There is little available information on the rate of encounters between anglers and swans, but Hampton Swan Rescue Group data is able to provide some broad indication for a heavily fished river with a large swan population (Table 6). The key message is that cygnets are most vulnerable to tackle-related incidents, and many of these need to be rescued more than once.

The stretch of the Thames between Teddington and Shepperton is a heavily populated and heavily fished part of the river. The figures indicate frequent interaction between swans and anglers in such places. Moreover, half of the rescues on this stretch of the river involve occasions when the swan has swallowed a hook and line (Table 5).

3.7 The source of the tackle

It is unclear how most swans get entangled in fishing tackle, but Hampton Swan Rescue Group has made observations and collated eye-witness accounts of others. The location of the tackle on the bird, and main causes of entanglement appear in Table 7.

From the Hampton data, it appears most events associated with heavily fished parts of rivers with large swan populations are associated with tackle currently in use. Some of the tackle reported as lost/discarded could be classified as unattended rods; on three occasions swans were rescued towing the complete tackle including the rod and reel. Birds which swallow line on which there is no hook (or bait) are thought to have been trying to free themselves of line caught round their legs or bodies. It should be noted that these conclusions relate only to the Hampton data and may not be representative of other areas.

Table 6. The rescue rate (rescues/bird/year) of mute swans on the Thames between Teddington and Shepperton, based on records of Hampton Swan Rescue.

	Number of birds present	Numbers rescued for		Rescue Rate
		Tackle	Lead	
1994				
Non-breeders (average)	124	52	6	0.47
Breeders	30	9		0.30
Cygnets	45-25	25	3	1.12
1995				
Non-breeders (average)	118	51	14	0.55
Breeders	20	6		0.30
Cygnets	47-34	24	1	0.73
1996				
Non-breeders (average)	142	68	12	0.56
Breeders	26	15	2	0.65
Cygnets	52-26	34	1	1.35

Note: these figures are minima since other organisations also rescue birds on this stretch. The two numbers given for cygnets are for the numbers hatched and the numbers fledged; the rate is calculated on the number fledged.

Table 7. The causes of swans becoming entangled with tackle (*n*=247)

Cause	**%**
Swimming "through" the line	31
Swallowing bait/hook	32
Entangled with lost/discarded tackle (round bill)	8
Entangled with lost/discarded tackle (round legs, body)	14
Swallowed without a hook	9
Miscellaneous	6

3.8 Lead Poisoning

Lead poisoning remains a problem, though the extent and significance of it are not clear. When the restriction on the use of lead fishing weights was introduced through Regional byelaws in 1987, it was not expected that this would lead to an immediate cessation of lead poisoning incidents because of the likelihood of lost lead remaining in rivers and lakes. While much of the lead ingested seemed to be from recently lost leads, or even where baits were taken and line with lead attached broken by the swan, others seemed to be the result of ingestion of long-lost lead exposed after floods or during exceptionally low (drought) flows. The presumed link between lead poisoning and old angling weights re-exposed by erosion has yet to be confirmed, but if it is, an increase in the incidence of lead poisoning might be expected to follow large flood events, such as the 1998 Easter floods in the Midlands. On this basis, lead poisonings associate with re-exposure of lost lead would be expected to go on for some time.

Most swan rescue groups do not routinely test for lead by taking blood samples, but rely on recognising the symptoms. In the most obvious cases, such symptoms (eg bent neck) are clear, but where the lead poisoning is less severe, it becomes progressively more difficult to diagnose. Hence some sick birds assumed to be suffering from lead poisoning may not have been, but equally, some which were not recorded as having been lead-poisoned could have been. There is published evidence that birds flying into wires may have higher than average lead levels, suggesting some reduction in response speed. One earlier study (O'Halloran *et al*, 1988) has shown this effect, whereas another (Perrins & Sears, 1991) failed to find it.

Current information on the extent of lead poisoning is rather confusing. In Table 1, lead poisoning only accounted for 104 of the rescued birds, or 4.1% of the total. This is a much smaller proportion of the angling-related casualties than some years ago (Table 8). In most cases, these recent diagnoses were not confirmed from blood lead analyses; only one swan rescue group was routinely doing this in 1996.

Table 8: Percentage of mute swans rescued on the River Thames 1983-1992 which were diagnosed as having lead poisoning

	Rescued	Lead	%		Rescued	Lead	%
1983	141	80	56	1988	173	25	15
1984	183	107	59	1989	304	75	25
1985	152	67	44	1990	337	76	23
1986	137	55	40	1991	351	55	16
1987	131	28	21	1992	377	44	12

Notes: i) these data are for live rescues only; ii) also excluded are some very high incidences of lead poisoning at Hampton in 1987 and 1988. Table based on data from Sears & Hunt (1991) and Lievesley (1997).

A sample of 210 pieces of fishing tackle removed from swans by members of the Swan Convention has been analysed. Of these, 92 samples included fishing weights. Only 13 of these were tested positive for lead and 7 of these were legal-sized dust-shot. The continuing number of lead poisoning incidents (Table 6) raises the question as to the origin of the lead.

The incidence of lead poisoning in swans has always been very variable, depending on environmental factors and the numbers of anglers. The highest frequencies of lead poisoning have usually come from birds living in flocks in urban areas. These also tend to be places where anglers are often concentrated. This is to some extent confirmed by observations by the Hampton Swan Rescue Group during 1994-1996.

These incidences of lead poisoning are not reflected in all areas. The Worcester Swan Rescue Group has recorded consistently high levels of lead in rescued swans. The Environment Agency has been funding blood lead analyses for rescued swans at Keele University and preliminary results are shown in Table 9.

Table 9. Blood lead levels (ppm) in rescued swans in the Worcester area during the four months July-Oct 1997

ppm	< 0.4	0.4-1.0	1.0-2.0	2.0-3.0	>3.0
n	27	20	9	5	8

In an earlier study on Thames Swans the Edward Grey Institute used a blood lead level of 40μg/100 mls (= 0.4 ppm) to indicate that birds had some degree of lead poisoning over and above what it might reasonably pick up from the environment. This figure was derived from a detailed study of lead poisoning in Canada Geese in the United States (Buck *et al* 1976). However, experience showed that it was a reasonable indicative level for swans. Worcester Swan Rescue Group data, contains a very high proportion (61%) over this 40μg/100 mls level, strongly suggesting that the birds were ingesting lead. The origin of this lead is currently unknown, but post-mortems on birds that die from lead poisoning will be carried out by MAFF in order to try and discover the source.

A report from the RSPCA centre at Stapeley Grange also reports that a high proportion of the swans brought to the centre in 1995 were suffering from lead levels greater than 0.2 ppm (Table 10). Direct comparison with the Worcester data is not possible since the RSPCA assumed that a level of 0.2 ppm was evidence for lead poisoning.

Table 10. Incidence of lead poisoning in Swans admitted to Stapeley Grange RSPCA Centre during 1995 [lead poisoned defined as > 0.2ppm]

Number admitted	224
Number tested for lead poisoning	128
Number classified as lead poisoned	64

Another recent record of lead poisoning comes from a paper published in the *Veterinary Record* (Jan 3, 1998) where fourteen dead swans were collected from an un-named loch in a country park in central Scotland during January to May 1996. Of these, eight had died of lead poisoning, six of them from swallowing leger leads. The cause of this was put down to falling water levels, making it possible for birds to reach lost weights that had hitherto been out of reach. This seems likely to be a rather special case, since it is not known how long the weights had been lying there.

3.9 Number of swans rescued

It remains difficult to make an accurate national estimate of the numbers of birds which are rescued annually. In 1996 there were 803 angling-related rescues (Table 1) made by the rescue groups who contributed data for this report. In addition, Egham Swan Rescue reported 626 angling related rescues in 1996, making up a total of 1,429.

Although the rescue groups covered here include most of the main groups, there are two major and quite a number of small to medium rescue groups whose figures are not known. At present, the number of angling-related rescues undertaken by all these other bodies cannot be more than an educated guess, but it seems likely that the annual total would be in the order of 2000.

3.10 The cost of swan rescues

Costs are difficult to estimate objectively because they vary greatly according to the type of rescue involved. Basically, there are three components.

i **Travel.** Using Wychbold figures, the average trip to rescue a swan is about 40 miles each way. Since around half the birds are returned to the place of rescue, the average mileage is about 120 miles. The average *travel costs*, based on 25p per mile, are therefore about £30 per bird.

ii **Treatment.** Many birds are treated on site at negligible cost, but others require veterinary care and this may be very expensive. Egham Swan Rescue has provided estimates of annual costs for angling-related rescues and the subsequent treatment of those which have to be taken into care. In 1996 the cost of 626 rescues was put at £14,288. This figure is mainly for the veterinary bills, through some vehicle running costs are included. Swan Life-Line produced a similar figure. The average *treatment cost* is therefore £22 per bird.

iii **Care.** For those birds which need to be kept for a considerable time (eg after an operation or after treatment for lead poisoning), the costs of care may be considerable. Wychbold estimates an expenditure of £7,500 on maintaining swans in care; this covers some 500 swans which are taken in during the year, an average *care cost* of £15 per bird.

The average costs of rescue, treatment and care for a bird are about £67 (£30 + £22 + £15). If it is assumed that the tackle- and lead-weight related birds are "average" in terms of requirements, 2,000 such rescues per year cost in the order of £134,000. This figure excludes all labour costs, since the rescue work is entirely on a voluntary basis.

4 DISCUSSION

4.1 Data collection

By highlighting the need for a more consistent approach to recording incidents, it is hoped that more meaningful conclusions can be drawn in future. There is serious concern, however, that many Swan Rescue Groups are not following the recommended format. This means the 1997 and 1998 data will have the same problems regarding consistency, thus limiting the confidence for drawing firm conclusions about the precise scale of the angling tackle problem. **For 1999, the strongest possible encouragement must be given to using the standard form (Version 5/5a, see Appendix) by all participants in the project.**

4.2 Management options

If the figures in Table 7 are representative, two thirds of swans involved in tackle related rescues (perhaps in excess of 1,000 incidents) become entangled while the tackle is in use. No anglers intentionally entangle swans, but many incidents could be avoided. Unattended rods is one particular area of concern.

Swans can be attracted simply by the presence of anglers. The use of groundbait or loose feed by the angler will often encourage swans to investigate a potential source of food, increasing the risk of then becoming entangled in the line or taking the baited hook. Segregation of swans from anglers will therefore work only up to a point and will only be suitable for certain situations.

There are a number of factors which, combined, produce 'black spots' for interactions between swans and anglers. Flocks, comprising mainly immature birds, usually occur in or near urban areas, often in places where local, young and inexperienced anglers tend to fish, especially in the school summer holidays. Not only are there a high number of tackle-related injuries to swans in these areas, but the incident-rate is generally higher than elsewhere. It should be possible to reduce the number of incidents in these places by prohibiting angling in the areas frequented by these flocks. However, this will only be effective if the swan-feeding public also co-operate by feeding the birds well within the angling-free zone.

For many years there has been a flock of non-breeding swans at Hurst Park, East Molesey, Surrey. This flock has had a high incidence of lead poisoning and a high rate of tackle-related injuries. In June 1993, a stretch of 350 m of riverbank was designated as a no-fishing zone and six notices were erected. The public was asked to concentrate their swan-feeding efforts only in this zone. Most anglers co-operated with this initiative and the area was also wardened by local volunteers.

The results were encouraging. During the two years before the ban, there was an average of 80 injuries per year in a flock of some 125 swans. In the two years following the voluntary ban, the number of incidents dropped to 32 and 31, although the flock size declined to 106 birds. That rescues still had to take place can be explained by the fact that there is still a considerable amount of fishing both upstream and downstream of the no-fishing zone, and on the opposite bank. Nevertheless, these results suggest that keeping swans and anglers apart, even on quite a small scale, can have considerable advantages.

5 CONCLUSIONS AND FORWARD LOOK

This phase of the project has highlighted the difficulties in trying to assess accurately the scale of the problem of angling tackle on mute swans. Consequently, the data in this study need to be treated with necessary caution. A start has been made, but there is still a long way to go before figures can be treated with confidence on a national scale.

Phase 2 of the project will analyse data collected by Swans Rescue Groups in 1997, 1998 and 1999. It will include a detailed analysis of tackle removed from injured swans. All weights will be analysed for lead, and the tackle will be examined with a view to identifying the types of angling which lead to most injuries. Blood lead levels will also be examined.

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7 GLOSSARY OF ACRONYMS

DETR	Department of the Environment, Transport and the Regions
MAFF	Ministry of Agriculture, Fisheries and Food
NRA	National Rivers Authority
ppm	parts per million
RSPCA	Royal Society for the Prevention of Cruelty to Animals

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List of Swan Rescue Centres

Water Bird Rescue	Wroxham, Norfolk
Swan Care	Hemel Hempstead, Hertfordshire
Swan Rescue	Droitwich, Worcestershire
Evesham and Cheltenham	Cheltenham, Gloucestershire
(now Cheltenham Swan Protection Society)	
Gwent and Barry	Barry, South Glamorgan
Cotswold Swan and Wildbird Rescue	Cirencester, Gloucestershire
St Ives and District Swan Rescue	St Ives, Huntingdon, Cambridgeshire
Swan Aid	Fairford, Gloucestershire
Swan Lifeline	Eton, Buckinghamshire
Hampton Swan Rescue	Hampton, Middlesex
Gwent Swan Rescue*	Newport, Bridgend, South Wales
(now Swan Rescue - South Wales)	

NB ***Authors of an original small-scale pilot study, now acting as swan rescue group co-ordinators for the project.**

APPENDIX

SWAN RESCUE REPORT FORM

SWAN GROUP: Swan Rescue - South Wales		SWAN IDENTITY
Tel. No. 01633 895241	Date:	BTO
LOCATION	PROBLEM	Darvic - Colour
	Tackle	- Number
	Pollution	Hospital
	Collision - Cable	Male
	- Other	Female
INFORMANT	Vandalism - Shot	Juvenile
RSPCA - Log No.	- Other	Cygnet
Police - Log No.	Predator (Dog)	
Public - Name	Grounded	Other Species
Tel. No.	Poorly	
TACKLE DETAILS	Territorial dispute	
Line: Light Heavy	Dead	ENVIRONMENT
Hook: Barbed Barbless		River
Weights: (Type)		Estuary
Toxic Non-toxic		Canal
Floats etc.	ACTION TAKEN	Lake/Pond
FISHING DETAILS	Not caught	Road
Coastal	Resolved in situ	Field/Garden
Coarse (free)	Into care	
Coarse (club)	To vet (**give name**)	
Game	To hospital (**give name**)	

Resources: 1. Rescue - No. of people: Miles: Time:

2. Release - No. of people: Miles: Time:

COMMENTS / OBSERVATIONS

RELEASE DETAILS: Date - Location -