



**THE IMPACT
OF
RECREATIONAL FISHING
ON
ESTUARINE BIRDLIFE
ON
THE FAR NORTH COAST
OF
NEW SOUTH WALES**

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Australian Seabird Rescue Inc.**

May 2004

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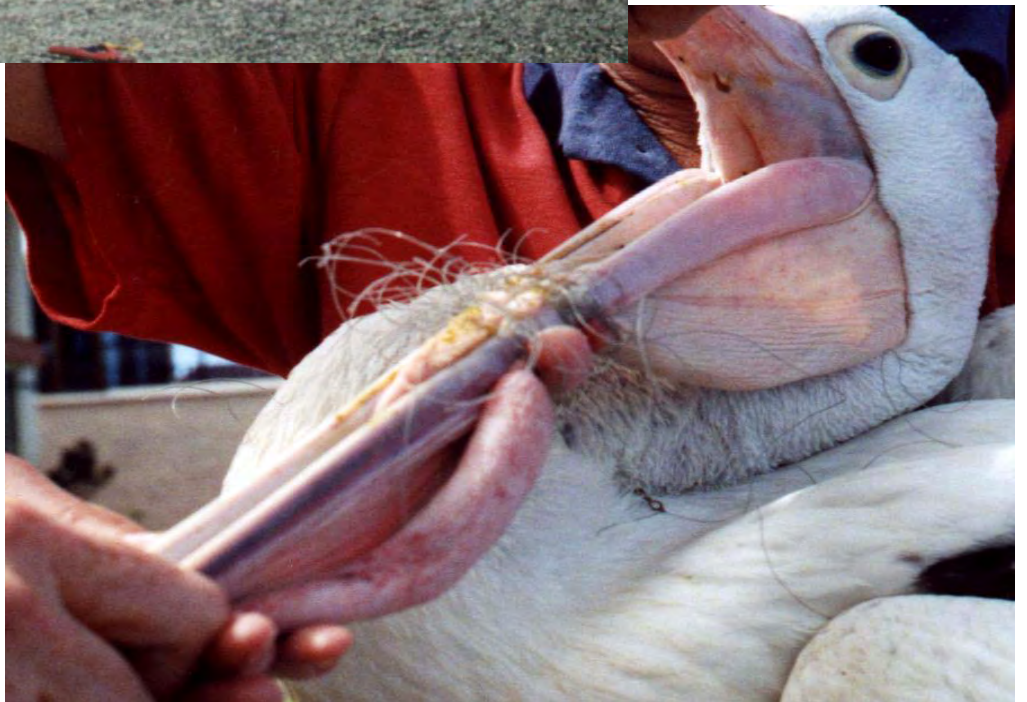
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COVER: Fishing tackle removed from the first ten pelicans rescued in the Richmond River 1992-3

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THE IMPACT OF RECREATIONAL FISHING ON ESTUARINE BIRDLIFE ON THE FAR NORTH COAST OF NEW SOUTH WALES

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and
Rochelle Ferris BSc (Marine Biology)

The impact of recreational fishing on estuarine birdlife, particularly seabirds, shorebirds and waterbirds, has generally gone unnoticed until 1992. Prior to 1992, the number of birds injured by fishing tackle along the coast of New South Wales, was considered to be minimal and therefore the impact of fishing activities posed little cause for concern, nor did the small number of reported incidents prompt investigation by management agencies. The ten-year study by Australian Seabird Rescue focused on estuaries between the Central Coast and North Coast of New South Wales. During that study period, rescue and rehabilitation of seabirds, shorebirds and waterbirds, revealed an alarmingly high number of injured birds. This study exposed inappropriate fishing practices, which directly affected birdlife, and determined that the highest incidence of entanglement in estuarine environments, was not caused by marine/estuarine debris, but by entanglement/hooking of estuarine seabirds and waterbirds by active fishers. It also established the risk factor across various species, quantified the rates of injuries and demonstrated high-risk areas within estuaries where birds gathered. The report recommends several solutions, which include public awareness campaigns, advice on more appropriate fishing tackle/practices and the establishment of specialist rescue personnel.

Key words: Recreational fishing, Fishing impacts, Estuaries, Estuarine birdlife, Seabirds, Shorebirds, Waterbirds, Pelicans.

INTRODUCTION

In September, 1992, an Australian Pelican (*Pelecanus conspicillatus*) was located in a quiet estuarine environment on the north coast of New South Wales with a fishing hook embedded in its leg. The bird was captured by local wildlife carers, successfully treated and released. After several more sightings of pelicans suffering from similar injuries, several members of the Northern Rivers Wildlife Carers Inc., (NRWC), were prompted to conduct a census of the pelican population in the Richmond River at Ballina. Of 108 pelicans counted on one day, 37 were suffering the effects of entanglement and hooking with fishing tackle. The injuries ranged from moderate lacerations to horrendous disfigurement, with evidence of limb amputations as a direct result of fishing line constriction.

As a result of the survey, Australian Seabird Rescue (ASR) was formed as a

group of marine wildlife specialists. The group's primary mission was to develop effective capture and treatment methods for pelicans and other marine species similarly affected, and to quantify the rate of injury along the east coast of NSW.

In the first year of operation, seabirds from estuaries along the north coast were rescued, rehabilitated and recorded. Of the 100 injured Pelicans captured in the Richmond River, in that first year, 92 were suffering entanglement and hooking by fishing tackle. Injury rates to other seabirds such as Crested Terns (*Sterna bergii*) and Silver Gulls (*Larus novahollandiae*) were difficult to quantify due to their generally nomadic nature, but numbers of actual rescues also indicated a high risk of entanglement and injury.

Throughout the ensuing ten years of study following the first capture in 1992, most of the estuaries from Shoalhaven Heads south of Sydney to

Noosa in southeast Queensland, were examined.

The alarmingly high rates of injury found in the Richmond River at Ballina were recurrent at every site. In most heavily human-populated areas up to one-in-five pelicans were hooked or entangled in fishing tackle. In areas containing, and adjacent to breeding colonies, particularly the central coastal zones from Gosford to Port Macquarie, where populations remain high all year around, rescuers often located and rescued up to 10 injured pelicans **per day**, mostly from small groups of 30 birds or less, foraging or roosting in high risk areas.

As a result of this long and intensive study, clear conclusions can be drawn from the data gathered. There are 173 estuaries along the east coast of New South Wales alone. At any one time, at least 10% of the pelican population in the study area were suffering from fishing line entanglement or associated injuries. It is reasonable to assume that similar injury rates existed in most of the 173 estuaries. This equates to at least 5000 injured pelicans per annum. Of most concern was the fact that this was a conservative figure for one species only, and did not include injuries sustained by other species of waterbirds, shorebirds and seabirds.

METHODS

Two vessels were used during the study: a 5.5 metre offshore vessel and a 4.2 metre aluminium runabout. Both vessels were fitted with powerful motors, which enabled speed of census, a high level of data acquisition and rapid captures of injured birds.

Using these vessels, regular observations of the pelican populations throughout the north coast estuaries, including the Tweed, Brunswick,

Richmond and Evans Rivers were conducted on a weekly basis using a minimum of two Australian Seabird Rescue personnel.

With the minimum two personnel, one drove the vessel whilst others counted and documented the populations of the various species. In the larger estuaries, such as the Tweed, Richmond and Clarence Rivers, each side of the river was examined with mid-stream sand cays and islands examined as they were encountered. The census studies were conducted from mid-day to early afternoon, when most species were roosting. As a result, there was a minimum margin of error in counting. Less than 5 pelicans were observed on the wing at those times and it was therefore deemed that the possibility of counting a bird twice was minimal.

In an effort to determine the impact of recreational fishing, across and within the various species, several aspects of study were undertaken. These aspects are enumerated as follows.

1. BIRD CENSUS OF THE RICHMOND RIVER

In August 1993, a complete census was undertaken of the pelican population in the Richmond River at Ballina, New South Wales. Previous studies by ASR of the birds' regular habitats afforded the volunteers access to, and observation of every waterbird and seabird in the estuary, during the course of each survey.

Further counts of pelicans were conducted at fortnightly intervals since that time to ensure that any seasonal fluctuations in population frequency were accounted for when analysing the results of the study, and a formal population census of all species followed in March 2000.

2. POPULATION FLUCTUATIONS OF PELICANS IN SEVERAL MORE ESTUARIES OF THE NORTH COAST

It was imperative that more data on population dynamics, namely seasonal fluctuations, be gathered from similar estuaries in the surrounding district. The study focused primarily on Pelicans, due to their susceptibility to entanglement with fishing tackle. To this end regular censuses of resident pelican populations were also conducted in the Tweed, Brunswick, Evans and Clarence estuaries. These counts enabled ASR to determine fishingline entanglement risk factors of the species during the various seasons and revealed a relatively precise assessment of the general coastal population dynamics of the species.

3. THE INCIDENCE OF INJURY TO RESIDENT PELICANS

The incidence of injury was also recorded during the population census. This incidence was recorded on a bird-by-bird basis then summarised by respective estuaries. This data was not only important to the results of the study in determining the overall levels of injured wildlife, but also highlighted estuaries, and of special importance, areas within those estuaries, which were of significantly high risk to the estuarine birdlife.

Significant high-risk areas were:

1. jetties and wharves
2. canal estates containing private pontoons and jetties
3. fish-cleaning tables, particularly those adjacent to boat ramps
4. boat ramps
5. narrow estuaries, where interaction between fisherfolk and birdlife is likely.

4. THE CAUSES OF INJURY/MORTALITY

The original study encompassed all forms of injury (not just mortality) to water/sea birds in the estuaries, including fishing line entanglement, boat-strike, powerline strike, pollution, disease and chemical pollution.

- Fishing line entanglement - this category was represented by those birds that had fishing line/hooks/lures, or any other kind of fishing tackle entangled around or embedded in any part of their body.
- Powerline strike – these injuries/fatalities occurred when pelicans flew into powerlines crossing bridges and in especially in places where two or more parallel powerlines crossed waterways. It was not determined whether parallel-oriented line or vertically-oriented lines posed the most significant threat, due to variations in the numbers of pelicans present in the areas of risk. A significant number of birds (7 pelicans in a 3-week period in 1996), struck horizontally-oriented powerlines at Fishery Creek, a tributary of the Richmond River
- Disease – while many seabird conditions are not visually obvious, an average of 10 birds per year suffered from diseases exhibiting symptoms such as botulism induced by anthropogenic activity.
- Boat Strikes – these injuries/fatalities were rare.
- Chemical Pollution – A minimal mortality factor with only one pelican in 1993 believed to have died from the effects of ingestion of diesel fuel.

5. BEHAVIOURAL STUDIES

In order to develop best practice methods of capture and rehabilitation techniques of seabirds, it was essential that ASR conduct extensive research into behaviour patterns and species interactions. Indeed these studies led to a report in its own right (Ferris, 2000). Suffice to say that indeed ASR did develop a concise understanding of these behavioural patterns and succeeded in developing highly effective and efficient techniques in the capture and rehabilitation of injured wildlife. Most importantly, habitat and roosting sites were studied at great length from camouflaged enclosures to ensure the accurate replication of their natural habitat in captive rehabilitation enclosures.

6. DEVELOPING SOLUTIONS

It became obvious that community education was the key to raising awareness of these previously unrecognised problems, which had the potential to wipe out a species. Awareness programs targeting inappropriate fishing practices and pollution issues were of paramount importance in reducing the rate of injury to estuarine birdlife. It was also evident that in areas where a proactive seabird rescue group was not operational, that those estuaries were considered to be of extremely 'high risk' in terms of injury incidence.

ASR embarked on a mission to raise community awareness of the problem.

RESULTS

1. CENSUS

Species of sea/water birds varied in numbers over the majority of species,

at random, however it was noted that there was an overall increase in all species during colder months.

The vast majority of species, migratory, nomadic and native, inhabit the lower reaches of the estuary, particularly in waters up to 5 kilometres from the river mouth.

Studies by ASR of the migratory habits of Pelicans revealed that Pelicans and other *Pelicaniformes* such as Cormorants and Darters are generally absent from estuaries during summer. It is during this time they return to remote breeding colonies, giving them some respite from the risk of fishing tackle injury during that season.

(See Map 1: Area of Study)

3. SEASONAL POPULATIONS

Relative to the sizes of estuaries to each other, the Richmond River census was a close representation to the averages of the observations made of all other estuaries along the central and northern coastline of NSW. Migratory and nomadic populations of species varied with seasons and it was found that the frequency of *Pelicaniformes*' in the Richmond River was considerably less during the warmer months. The majority of Pelicans (*Pelecanus conspicillatus*) left the estuaries during October and November each year, returning around early May. It was found that the numbers of Pelicans in the estuaries were directly proportional to the weather patterns, with rainfall being a major influencing factor. (See Graph 1).

3. THE INCIDENCE OF INJURY TO PELICANS

On the first reconnaissance of the Richmond River in September 1992, it was noted that in a pelican population of 108 resident birds, 37 were suffering

from injuries and were either entangled or hooked by fishing tackle. A program of capture was commenced and these and another 63 from the same river were captured and treated, making a total of 100 injured pelicans rescued during the ensuing 12 months.

Subsequent years saw a decline in injury rates in pelicans and other water/sea birds in the Richmond River following an intensive community awareness campaign conducted by the Ballina-based ASR team. The decline in injury rate continued until it reached 40 % of the Pelican population, with an average of 40 pelicans per annum regularly rescued from north coast estuaries. Injury rates remained high in estuaries not addressed by rescue teams.

During the term of the study, ASR volunteers at Ballina, NSW, rescued 537 Pelicans, mostly from the estuaries of the north coast. (*See Graph 2*)

4. DETERMINING THE EXTENT OF POTENTIAL CAUSES OF MORTALITY

Potential life-threatening or debilitating conditions affecting the 537 pelicans rescued or retrieved are as follows;

Fishing-line entanglement: 94.04% suffered from fishing tackle hooking or entanglement.

Disease: 3.72% either died or were rehabilitated, suffering from diseases such as botulism. Most of these were located in the estuary following heavy rain after long, dry spells. Rotting plant and animal matter flushed into the river from stagnant drains was believed to be the cause of the outbreaks.

Powerline strike: 1.86% were killed or suffered major injury from collision with powerlines. The installation of deterrent discs on powerlines in 1996

reduced this factor to nil, in following years.

Boat strike: 0.18% suffered boat strike. Whilst a relatively small number, it emphasised the need for education of boat-owners to be aware of the potential of collision with birds.

Chemical pollution: 0.18% were affected by chemical pollution, when it was deemed that one pelican was found dead in an area of water polluted with diesel fuel.

Fisherfolk -vs- Pelicans.

Throughout the course of the study, numbers of fisherfolk were counted in an attempt to ascertain the primary cause of entanglement. Although numbers of recreational fisherfolk varied with seasonal and weather conditions, no correlation between the number of active anglers and the number of bird injuries, at any given time, could be determined.

One could suppose from observation that coincidental timing of the migratory patterns of pelicans seeing them leave estuaries during summer, at the same time as many holidaying fisherfolk are arriving, is just pure luck on behalf of the pelicans. Such is not the case at estuaries where breeding colonies are present, (i.e. Wallis Lake at Forster NSW), where a high population of pelicans is present all year round.

At the end of the day's census of the Richmond River in 1993, another "fly-by" census was taken in the afternoon. Eleven pelicans had become entangled during that day. Active recreational fisherpersons numbered only ten in the entire estuary during the 8 hours of study and few seabirds or pelicans were seen in or near the vicinity of the fisherpersons, certainly, it seemed, not enough to explain the high number of entanglements in such a short time.

Upon further inspection of the estuary, **ASR found 53 un-attended, set fishing lines trailing from wharves and jetties.** The wharves and jetties were privately owned by riverside residents, along the northern bank of the Richmond River in canal estate systems situated about 5 kilometres upstream from the mouth of the river. These areas are particularly favoured by pelicans.

In a search to correlate these two observations, it had been noted during the studies of pelicans' behavioural patterns that the birds regularly foraged beneath and around mangroves where there is often a high presence of spider-webs.

Observations of pelicans foraging near the set lines suggested that they were oblivious to the hazard and it might be reasonable to assume that they are incapable of visually detecting the difference between the fishing lines and spider silk. Thus they approached the fishing line, heedless of the danger and became entangled.

Throughout the course of the ensuing 8-year study, several pelicans were seen to become entangled whilst swimming through set lines in these areas. They invariably sense a restriction of their movement and in their attempt to fly off, drag the hook from the riverbed, which may subsequently embed in their body and/or they become entangled in a length of line.

It was not uncommon to find up to 20 loops of line around pelicans' limbs. Their attempts to remove the line predictably result in the tightening of the loops causing constriction, which develops gangrene in the limb and subsequent loss, if they survive systemic infection.

At that time, the studies thus revealed that the single most significant cause of entanglement to pelicans was due to the practice of unattended, set lines and, to a lesser extent, entanglement with discarded tangled line.

The practice of anglers fishing near, or in the vicinity of foraging pelicans was suspected as a high risk factor, particularly near fish cleaning tables where the birds congregated to feed on scraps, although at that time, no substantial proof could be established. **However, this fact was proven during 2001, when, following a major fish-kill, the Richmond River was closed to all forms of fishing for a period of five months.**

During the period of closure, not one pelican, or any other species, for that matter, was found entangled in fishing tackle. By stark contrast, in the first seven days of the re-opening of the river to recreational fishing, seven pelicans became entangled and/or hooked in fishing tackle. The high injury rate continued for several months.

In any period of five months, prior to the closure of the river to fishing, ASR members regularly rescued up to 40 seabirds/waterbirds injured by fishing tackle. None became hooked/entangled during the 5-month closure.

These emerging facts considerably altered the focus of the study. Media awareness programmes had reduced the incidence of un-attended set lines, and discarded line was still evident on beaches and rock-walls during the closure to fishing. This indicated that active fishing was the primary risk. Not only was there a shift in opinion on the primary cause of injury, but ASR personnel faced a

considerable problem in addressing the issue.

ASR volunteers were then required to maintain a good rapport with fisherfolk, whilst diplomatically indicating that actions of active fisherfolk were the main cause of the birds' entanglements. It was important not lay blame on the fisherfolk and that any accident was only due to lack of awareness. Most importantly, during dialogue with responsible fisherfolk, was our knowledge that no-one intentionally hooked birds while fishing.

Of significance in determining the cause of entanglement with pelicans was the high incidence of upper-body entanglements or hooking in the species, indicating that discarded line was not the primary cause.

Following the spate of injuries, following the re-opening of the river to fishing, and previous recorded observations, a request was made by ASR to NSW Fisheries on 20 September 2001, for a 50-metre 'No Fishing' zone to be declared at the Fishery Creek boat ramp. This was the highest recorded area for pelican entanglement in the Richmond River. The request was denied.

Smaller seabirds such as Crested Terns, Silver Gulls, and many species of land-based birds are more likely to become entangled in discarded fishing tackle due to their regular foraging on or near the shore.

On the other hand, Pelicans' natural foraging usually takes place in the water and they are less likely to become entangled in tangled line discarded on rocks or beaches.

Many land-birds use discarded, tangled fishing line in nest construction with disastrous consequences.

In co-operation with the NSW NPWS, Ballina ASR volunteers monitored nesting sites of Ospreys. On several occasions, the NPWS were called to remove clumps of entangled line from Osprey nests in the Ballina area. In 1999, at Tweed Heads, the National Parks and Wildlife Service were called upon to remove line from small osprey chicks, which had become entangled in the nest.

5. BEHAVIOURAL STUDIES OF PELICANS

It was found that there were five distinct, individual behaviour patterns within the pelican population. Identifiable, individual birds were found to retain these traits during the course of the ten-year study. This enabled rescuers to predict the likely activity of a particular bird and enable capture even though the bird still retained its flight capabilities.

There are many who continue to doubt this fact, even at the time of writing, however, although many injured pelicans captured were still able to fly, the knowledge gained from the study considerably enhanced the success of rescuers. Over 80 percent of the 537 pelicans rescued during the study, still had total flight capability.

Several wildlife veterinarians, including Dr Evan Kosack (Alstonville NSW), Dr Rosie Booth (ex Currumbin Sanctuary QLD), Dr Ian King (Ballina NSW) Dr Ann Shaw (Ballina NSW), Dr Jim McInerney (Yamba NSW), Dr Tony Gestier (Vetafarm P/L at Wagga Wagga, NSW), Dr Libby Hall (Taronga Zoo, Sydney NSW), were consulted during the study, and with

their knowledge and the knowledge gained by ASR rehabilitation personnel, the handbook, "Rescuing the Australian Pelican" (Ferris, 2000) was produced.

During the 'Iron Barron' oil-spill in Tasmania (1995), the book was described by authorities as 'the definitive guide to the rescue and rehabilitation of seabirds.'

The book contains all relevant information pertaining to effective capture and rehabilitation methods for pelicans and seabirds developed by ASR during these studies.

6. ASR – WORKING TOWARDS A SOLUTION

In order to address the excessive rate of injury to estuarine birdlife, workshops with other wildlife groups commenced in 1994 and the Ballina ASR have conducted lectures with wildlife groups across Australia.

Ballina ASR has achieved a 90% rehabilitation success rate with injured pelicans they have taken into care. With the knowledge and experience gained, volunteer lecturers from the Ballina-based group conducted training programs and workshops with other wildlife groups. Since the original study, there has been a noticeable decrease in the injury rate to all seabird/waterbirds species in the Richmond River. Whilst the 60% decrease in injury rate is encouraging, the current rate of 40% (of the original figure of 1992), is still cause for concern. At the time of compilation of this report, an average of 40 pelicans per annum were still being rescued from estuaries on the North Coast.

A program of awareness through the media commenced resulting in over 500 TV news stories, both local and

national, and thousands of newspaper articles to date. In the Ballina area, the public was kept aware of the problems of discarded fishing tackle, inappropriate fishing practices and estuary pollution issues through the regular weekly column, 'Wildside', every Saturday in the regional newspaper, The Northern Star.

Following the intensive community awareness campaign and the media coverage gained during this time, financial and material sponsorship resulted through the NSW Department of Land and Water Conservation's Coastcare group and the local community, and a rehabilitation centre was established at Ballina.

Regular media stories kept the public aware of the hazards of discarded pollutants, such as tangled fishing line and plastics. Coupled with the dissemination of information through the media and rescue workshops, volunteers have been in high demand as guest speakers at service/recreational clubs and schools. It is estimated that the Ballina ASR have lectured over 24,000 adults and school students in the area since 1992. The incidence of unattended set lines in the Richmond River has decreased, with a proportional decrease in bird entanglements.

All riverside residents on the Richmond River were informed of the potential hazards of the practice and awareness campaigns increased community involvement in the reporting of injuries. These programs were also relatively successful in reducing the presence of set lines.

The practice of discarding fishing line also decreased in the Richmond River and educational programs conducted by the Ballina ASR have prompted riverside residents and beach walkers

to collect the discarded line and other pollutants. Even though education programs continue, the rock walls at the mouth of the Richmond River and other estuaries still remain a 'dumping ground' for discarded line and plastic bait bags.

A community dialogue began regarding the use of various types of fishing hooks. Normal steel hooks were regularly discussed on TV fishing programs as 'rusting away in a few days'. Ballina ASR conducted experiments with several types of fish-hooks and found that it takes several months for a normal steel hook to rust. Some hooks were placed in seawater whilst others were placed in an acid similar in strength to that found in the stomach of a bird or a fish to simulate the shelf-life of a hook after being accidentally ingested by the animal. Although normal steel hooks may eventually rust, evidence has shown, that if embedded in a bird, fatal systemic infection could result. The use of these hooks is, however an advantage if the hook is lost or if an affected bird survives the months of the hook's lodgment until the hook rusts away. Several pelicans were observed for several weeks, prior to capture, with fish-hooks in their legs. Upon capture, the hooks still retained the barb and although partly rusted, were still complete. However, many birds were found near death from systemic infection within a week of being hooked.

It is the stainless steel and alloy hooks which resist rust, that remain of great concern. If an injured animal dies, it is likely to be scavenged by other fauna and the hook may lodge in the scavenger resulting in a perpetuating 'domino-effect' of wildlife deaths.

A considerable number of birds suffering from embedded lures were rescued during the course of the study. These included Pelicans, Silver Gulls, Crested Terns and Australasian Gannets. In most cases the art of lure fishing is to cast the lure and retrieve it on a constant basis. For a bird to be hooked by a lure, it is reasonable to assume that the angler was casting in the vicinity of the bird/s.

RECOMMENDATIONS

1. The practice of unattended, set lines was initially identified as the primary threat to estuarine birdlife, however as the study progressed, it became obvious that active fishing posed a similar threat. It is recommended that legislation banning the practice of un-attended set lines be implemented.
2. It is also recommended that a nationwide program of awareness promoting responsible recreational fishing practices is crucial in preventing the incidence of injury to estuarine wildlife.
4. It is the opinion of the Ballina ASR that due to the extended life of stainless steel or alloy fishing tackle that the practice of using alloy or stainless steel hooks should be discouraged. These hooks remain intact, indefinitely, if embedded in the body of a bird and are a significant cause of serious, if not fatal infection.
5. Consideration should be given to establishing small 'No Fishing' zones at boat ramps, particularly those where fish-cleaning tables are located and where there is a high presence of pelicans and seabirds. It is unlikely that, say, 50-metre no fishing zones at those

areas would be an imposition on fisherfolk.

6. Although not discussed in this study, discarded bait bags are an environmentally hazardous by-product of less responsible fisherfolk. These bags are one of the most common sources of marine litter found in the estuaries, on rock walls and beaches. Biodegradable plastics are available in Australia and should be used in the production of bait bags. Information from sources around the world, including the UK Marine Conservation Society, the US Dept. of Fisheries and Wildlife, Dr Colin Limpus of the QLD Dept. of Environment and Heritage, Dr Julian Pepperell (author of the NSW EPA brochure 'Plastics in the Sea' 1994), indicate that plastics are often ingested by seabirds, marine turtles, whales and dolphins

SUMMARY

ASR considers that the high rate of fishing tackle entanglement with estuarine birdlife is of serious concern. This study focused mostly on pelicans due to the evidence of the species' susceptibility to injury by fishing tackle.

The most serious threats to the species were inappropriate fishing practices, where fisherfolk cast their line at, or near foraging birds, hooking or entangling the birds. This second-most common cause was birds becoming entangled in lines, which were left set and unattended.

As opposed to accepted 'convention', discarded fishing line was found to cause only a small percentage of entanglements, with land-based birds

being more susceptible than seabirds, waterbirds and shorebirds.

Pelicans are likely the most promoted of all coastal species in respect of their value as tourist icons and although these and other species may not be considered endangered, it is patterns of human destruction and ignorance that lead many species to such a horrific end. The often horrendous injuries encountered must be addressed and reduced, if only from a humane point of view.

U.S. studies at the South Pacific Wildlife Project in S. California, where over 700 brown pelicans were rescued in 1994, are indicative of similar issues where species are threatened, largely from the effects of fishing tackle entanglement.

Where there is no proactive wildlife group in operation, it is also likely that most resident pelicans in high human-populated areas will become entangled within a 12 month period. It has been the experience of many rescuers to capture the same (identifiable) bird up to 15 times in a four-year period and up to four times in one year.

Whilst the Ballina-based ASR is relatively successful in addressing the rate of injury in northern NSW estuaries, the figures remain unacceptably high. Areas along the coast, remote from the proactive operations of a seabird rescue group, are considered 'disaster zones' and urgently require the establishment of rescue personnel trained in rescue and rehabilitation methods and media awareness campaign techniques.

The workshops conducted by the Ballina ASR are restricted to suitable funding and availability of trained lecture personnel. Assistance from the

Australian Government's Natural Heritage Trust (NHT), Coastcare, and other sponsors, has enabled ASR personnel to establish trained personnel in Victoria, South Australia, Queensland and Western Australia. Whilst the workshops have been effective in some areas, the lack of adequate funding and time considerations of volunteer lecturers hinders effective dissemination of information.

With assistance from the NHT, lecture personnel from Ballina, NSW, have been active in lecturing school students around the country, on the problems facing our estuarine wildlife. NSW Fisheries, in co-operation with Australian Seabird Rescue, have also printed a brochure, "Responsible Fishing to Reduce Wildlife Injuries", which has been distributed along the coast of NSW.

It is the opinion of ASR personnel, that trained rescuers, rehabilitators and lecturers with suitable rehabilitation facilities should be established at strategic locations, not only on the coast of New South Wales, but indeed around the entire coast of Australia.

CONCLUSION

The impact of recreational fishing on estuarine birdlife is a serious and ongoing problem. A single hook embedded in a leg, or a mere 50 centimetre length of line entangled around a wing, can prove fatal.

Many species of seabirds, shorebirds, and even land-based birds are affected.

Anglers are increasing along the coastline, as is the encroachment of human population on species' habitats. While many species are not, as yet, in danger of extinction through

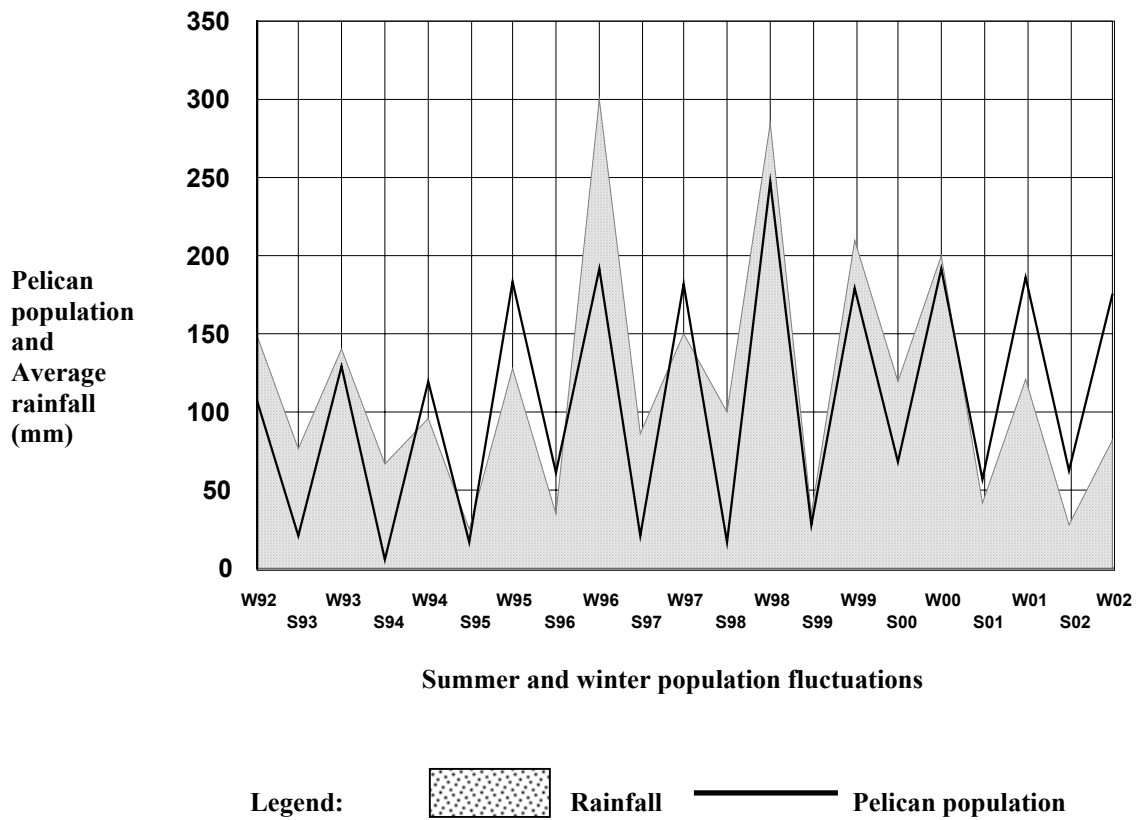
recreational fishing activities, the extent of the negative impact of fishing indicates a real threat for the future.

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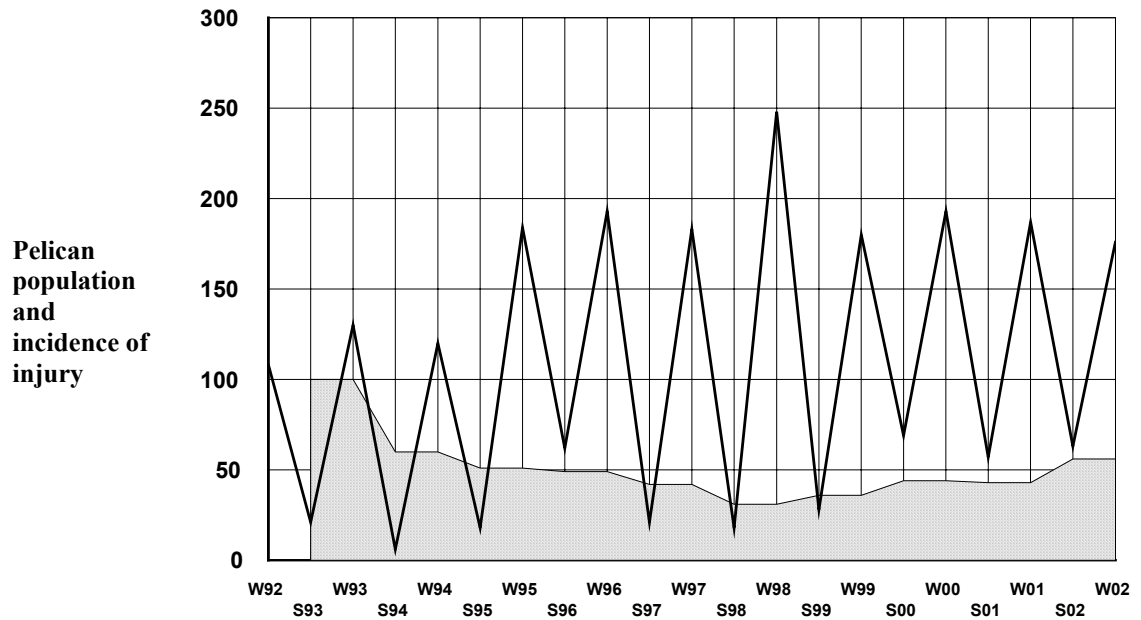
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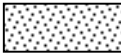

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Graph 1: Population fluctuations of Australian Pelicans on the Richmond River, Ballina NSW 1992-2002 as a function of rainfall.



Summer and winter population fluctuations

Legend:  Pelicans injured  Population

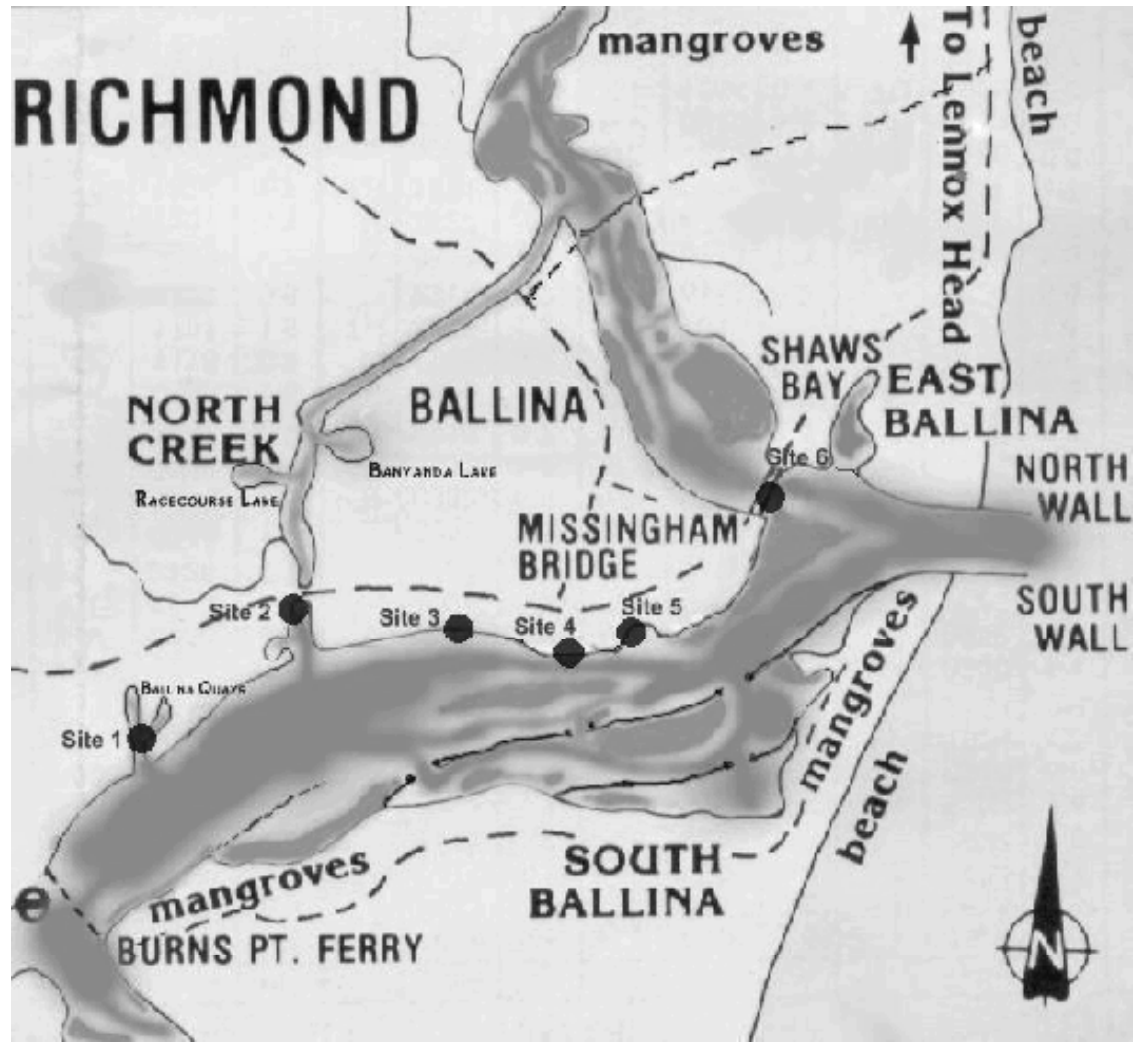
Graph 2: Population and injury statistics of pelicans on the Richmond River, Ballina NSW 1992-2002

Table 1: Assessment of Fishing-Tackle Risk Factors for Various Species of Birds in Coastal Environments

SPECIES	RISK	MOST COMMON CAUSE
Pelicans	Very high	Shows little fear of humans. Frequents fishing areas. Forages near shoreline and in vicinity of un-attended set lines. Prone to be hooked by active fishers.
Cormorants	High	Dives beneath the water for baited hooks cast in vicinity. Takes baited hooks from active fishers. Becomes entangled in lines as it dives to forage.
Seagulls	High	Swoops for cast baits from active fishers. Little fear of humans. Becomes entangled by flying through fishing lines. Is prone to discarded line entanglement when foraging on riverbanks and beaches.
Terns	High	Plunge-dives for cast baits. Forages near fishermen.
Ospreys *	Medium	Uses discarded line for nesting material.
Kites	Low	Can become entangled in discarded line on shores.
Darters	Low	The relatively small numbers and timid nature usually deters this species from interaction with anglers, however can become entangled in line snagged on rocks below the surface, when diving.
Hérons	Low	Discarded line in intertidal zone.
Egrets	Low	Discarded line in intertidal zone, is also hooked by active fishers.
Oystercatchers * (Pied and Sooty)	High	Endangered species. Entanglement in discarded line on beaches and intertidal zones. Roosting and nesting habitats under threat by disturbance of 4WD vehicles. Chicks often seek refuge in 4WD tracks.
Ibis	High	Discarded line on shores. Often rummage through open bins and become entangled in discarded line.
Gannets	Medium	Shows little fear of humans. Will approach boats at sea and plunge-dive for cast baits and lures.
Shearwaters (Muttonbirds)	Medium	Shows little fear of humans. Will approach boats at sea and plunge dive for cast baits and lures.
Magpies	Medium	Uses discarded line for nesting material.

* indicates endangered or threatened species.

MAP 1. AREAS OF RISK FOR BIRDLIFE INJURIES WITHIN THE RICHMOND RIVER, BALLINA, N.S.W.



Site	Topographical feature	Injury risk
1	Narrow canal bordered by dwellings, many of which have pontoon moorings or jetties.	Moderate risk. Un-attended set lines. Close proximity of foraging birds to active anglers.
2	Boat ramp with nearby fish-cleaning table. Narrow channel.	High risk. High prevalence of pelicans foraging for fish scrap. Site favoured by anglers.
3	Riverbank dwellings with jetties.	High risk. Un-attended set lines.
4	Riverbank wharves.	High risk. A particularly favoured site for anglers and foraging birds.
5	Boat ramp with nearby fish-cleaning table.	Moderate risk. Area favoured by foraging pelicans. Moderate presence of anglers.
6	Bridge.	Moderate risk. Regularly used by anglers fishing from bridge. Dangling lines pose a threat to birds in transit.

* Note: Sites 3, 4 and 5 are in view of the pelican colony's favoured roosting site on the sand cay in the middle of the river. Any fisherfolk activity attracts the attention of roosting flocks.