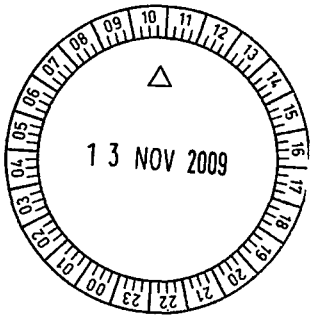
Submission to the Public Administration Committee, Legislative Council

Re: Recreational Activities Within Public Drinking Water Source Areas



From.

Michael Morcombe

PUBLIC

PUBLIC ACCESS PUBLIC
STATE FORESTS AND NATIONAL PARKS

The Effects of allowing public access to catchment areas

This submission is principally concerning the economic and conservation benefits of allowing public access to Crown Lands, including Water Catchments and National Parks. There are also recreation and social benefits

The attraction of Australia for a large proportion of both visitors from overseas, and Australian citizens exploring this content as a preference to traveling overseas, is its environment of sparsely inhabited "outback". There the natural environment, the landscape, flora and fauna are by comparison with the much more crowded developed continents, seen to be closer to a wilderness experience.

It is these vast open spaces, forests and coastlines, uncrowded, that differentiate Australia from most other nations. Cities, roads, bricks and concrete are much the same worldwide In contrast, it is obviously in its natural environment, its flora and fauna, that Australia is truly unique.

As one of the least populated places on earth, Western Australia one would think, could afford to permit public access to its huge areas on natural and semi natural environment.

But very large tracts are now becoming locked away, banned or not easily accessed. With the planned banning of the public from much of State forest, this is becoming a continent where one can travel for hours along rads, from one concrete jungle of city and suburbia to another, but banned from access to the very experience which makes Australia such a unique nature experience in comparison with most other countries.

As an example of the huge economic benefit that can flow from promotion of the natural environment and its creatures, are the following overseas studies of the recreational activity of bird watching, or bird study, commonly known as " birding"

There have been a number of such studies in USA over recent years, of the economic benefits of birding. This is especially an activity of Europe and USA, where people are affluent enough to devote time and money in following this as a hobby, seeking sightings of bird species, often trying photography of birds.

Birds differ from most other wildlife in being about and active by day, colourful, often with interesting behavior, so attracting public interest. Declining bird numbers are often an early indicator of an environment becoming seriously degraded.

But to promote Australia as a continent where ecotourism is encouraged, where there can be experience of solitude in sparsely populated wilderness areas, where birds, wildflowers can be found, becoming a false promise. Increasingly such areas are becoming locked away, perhaps for the convenience of the controlling body or department, perhaps as the easiest way to exercise control...by keeping out the public.

But perhaps this tendency will have future repercussions if the news spreads that the promoted experience of seeing natural habitats an wild creatures, is largely false, with access so often banned. This could discourage nature based tourism, and certainly not likely to encourage.

Attached are printouts giving the economic value of birding in USA. Such huge figures in dollars reflect the size of population, and would need to be divided by 10 for Australia's bird generated income of domestic origin, but there's also the inward tourism from Europe and USA.. Here while our the birding part of tourism alone must be significant, there's also the wildflowers, and the natural scenery, and the local nature-based tourism.

All are earnings which can be damaged by the steady loss of 'wilderness' places to go to experience nature. Controlling authorities seem even if allowing entry,to require permits, fees, commitment to set dates months ahead and so on, which often make the desired access quite impractical, and so much more so for seeing or photographing wild creatures.

CONSERVATION VALUE OF ACCESS TO NATURAL ENVIRONMENT: BIRDING.

In order to asses the decline of bird species, Australia's principal bird study organization, BIRDS AUSTRALIA (formerly the Royal Australasian Ornithologists Union) have over a period of almost 40 years, been conducting continuous surveys of bird populations.

This has been done by enlisting volunteers from the large membership, to record birds, whether these are seen around a member's home town, or on travel into remote outback regions. These lists have been published so far on two volumes, as the Atlas of Australian Birds. This survey is ongoing, and results can be seen at www.birdata.com.au. where distribution and abundance maps can be called up, by entering the name of any Australian bird.

Many thousands of members have contributed sightings. The information is vital to assess the conservation effort needed to protect endangered species, and see which habitats or regions of the Australian content is suffering from climate change or other damaging influence.

To restrict access of these bird observers from such huge areas of Australia would be detrimental to the continuity of such valuable surveys by these many members who have until now had public assess.

RELEVANT PERSONAL EXPERIENCE OF THE AUTHOR OF THIS SUBMISSION.

Michael Morcombe has been observing, writing books about, photographing and illustrating with artwork, not only the birds, but also wildflower mammals and reptiles. since about 1960.

He has had more than 40 books published, of Australian birds, other wildlife, wildflowers, national parks and the like. Most of these books have covered the whole of Australia, but as a resident of Western Australia, with close experience of the local natural environment, he has built up a comprehensive photo library strongest on WA subjects. His books give

this state its full share of the continent, matching its large portion of the continent. Most books by other authors have originated in the eastern states, and typically give W.A. a much smaller space allocation.

Books published about Western Australia, however, are stocked in bookshops at very low levels, just as are books about individual eastern states not stocked in most W.A. bookshops.

So it follows that the best way to promote W.A. is to do so in an Australia-wide subject book, eg National parks or Birds of Australia, (rather than parks or birds of W.A) which ensures widest distribution, then to ensure that the amount of WA content is large, commensurate with WA's very large portion of Australia's natural attractions.

These books, some 40+ titles, with probably between half a million copies and one million copies, are now scattered worldwide. A Google search entering in the three words *Michael Morcombe Australia*, gives some thousands of "hits", being internet entries showing these books to be held in public and institutional libraries, and with booksellers, in many parts of the world.

These are long-lasting (compared with a (very expensive) TV promotion lasting but a few days . Those that are in public and private libraries show to their users, perhaps over a period of perhaps several decades, the beauty of Australian natural scenery, birds and wildflowers, and perhaps awakening an interest in traveling to experience that Australian natural environment for themselves.

But on arrival, will they be able to have reasonable access to natural environments? That is, other than rigid conducted tours . Or will they encounter just locked gated around the State forests and other remaining areas of natural environment? Is it not a false promise to entice tourists to Australia, then deny access?

Then there are those who photograph, paint, write about these subjects, whether for their personal enjoyment, or to publish. Unless the increasing number of artists, photographers and writers have access to the natural environment, the raw material of their books, films, artworks, this will stifle the flow of new books to worldwide destinations.

This is a free advertisement promoting tourism within and into Australia, costing the tourism industry and government nothing, and in held in public and home libraries, are a steady long-continuing promotion.

Government should be assisting these activities. This need not cost anything, unlike the hugely expensive short-lived TV promotions usually tried. All that is needed, is reasonable access for these artistic endeavors which spread so far and wide promoting AUstralia. Basically, there is needed access to State forest and other sites of natural environment, without the need for complex permits and fees, which can be so inflexible as to be useless.

So any denial of public access to prevent public access to Western Australia's water catchment areas should be overturned. On the above economic basis, as well as for recreational and other reasons.

CONSERVATION RESULTS OF THE AUTHOR'S PERSONAL ACCESS TO LANDS

In 1965 Michael Morcombe was preparing a book of Western Australian wildflowers (Published 1966 as *Australia's Western Wildflowers*) For a chapter on the use of these unique flowers by such equally unique creatures such as the tiny Honey Possum and Pigmy Possum, as well as the many kinds of nectar seeking birds, he set out to find and photograph Honey Possums at Cheyne Beach, on the south coast east of Albany. But instead if finding a Honey Possum, he found a small native marsupial carnivore known as the "Dibbler" (Antechinus apicalis) . This animal had not been seen for 83 years, and had long been presumed to be extinct. (See attached reprint from The Western Australian Naturalist)

As a result of this discovery, the tract of land on which it was discovered has been made a conservation reserve. But for that discovery, it would have most likely become degraded and unsuitable for its rare inhabitant.

The Dibbler is still an endangered species, with a captive breeding program at Perth Zoo, for purpose of re-populating other areas of its original habitat.

If that part of the coast had in 1965 been closed to public access, as now proposed for the water catchments, that unique Australian marsupial could well have become extinct through destruction of.habitat.

Similar applies to the Bungedore Park on the Darling Range above Armadale, now a much used and widely appreciated bushland recreation and conservation area. In the 1960's approximately, it was used for nature observations, and photography, by Michael Morcombe. But also by the Main Roads Department, as a source of gravel. Hence the large areas of gravel pits which have now been replanted with local flora.

When the asked the machinery to stop, as it was a C class reserve, extraction ceased, and with the conservation value of the site put to Main Roads, there was no further extraction. A Bubngendore Management committee has since then rehabilitated and controlled the area for conservation of flora and fauna and passive public use of the site.

These are but a few of the conservation outcomes of public access to land. There are very many other examples where members of the public, through their interest or concern for land of conservation value, or for rare flora or fauna,have been able to bring about a valuable outcome. Had there not been access by the public, many of these valuable outcomes results would never have happened.

THE ECONOMICS OF BIRDING

The Growth of Birding and the Economic Value of Birders

Part 4: 1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation
Index | Part | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10**

The economic value of birders was revealed by a 1991, US Fish & Wildlife Service survey (see **next page** for the 1996 survey).

Quick Facts:

- 63.1m feed wildbirds at home
- 24.7m took at least one trip a year (casual birders)
- One half of one per cent are 'serious birdwatchers', giving us a total of around 123,500 highly committed birders
- Wildlife watchers spent $18.1bn in 1991. Birdwatchers form 80% of this group.
- $14.4bn spent by birdwatchers
- $6bn on trip related expenses (food, lodging, transportation)
- $7.6bn for equipment (special vehicles, bird food, feeders, baths and houses; photography, binoculars, scopes, clothing, packs, camping equipment)
- $240m for magazines
- 560m for membership dues
- Number of birding festivals listed in the Festival Directory
  1993—12; 1994—18; 1995—23;1996—48; 1997—70; 1998—120

Fact Sheet: Birding as an Economic Asset

- In the United States in 1991, 63 million people were residential bird feeders (less than one mile from home).
- Of the 54 million Americans who reported watching wildlife around their homes, about 51 million (94%) were "backyard" birdwatchers (USDI Survey, 1993).
- In 1991, more than 24 million Americans took trips for the express purpose of watching wild birds, versus 14 millions hunters (3 million migratory bird hunters) and 35 million anglers (USDI Survey, 1993).
- Kellert estimates that about 3% (3 million) of the 63 million residential bird feeders could be considered committed and that about 0.5% could identify at least 100 species. Therefore, the number of committed birders is estimated to be between 300,000 and 1.3 million (Kellert, 1985).
- Each year, more than $19 billion is spent on nongame wildlife appreciation in this country (USDI Survey, 1993). Undoubtedly, the largest part is contributed by bird enthusiasts.
- A total of $9.6 billion was spent in 1991 on equipment and supplies for nongame wildlife appreciation activities (USDI Survey, 1993).
- Annually, $2.5 billion is spent on bird seed, feeders, baths, and nesting boxes. (USDI Survey, 1993)
- The average birder annually spends more than $350 on travel and paraphernalia related to bird watching. Committed birders spend much more--on average, active birders annually spend about $2,000 on birdwatching, with half that amount on travel, i.e. avitourism (Wiedner and Kerlinger, 1990).
- In 1991, 30 million Americans took trips for the express purpose of nongame wildlife appreciation, including viewing and photographing wildlife. They spent $7.5 billion on trip-related expenses, including $4.4 billion on food and lodging. (USDI Survey, 1993)
- Avitourism keeps growing as travel becomes cheaper and easier. In 1988, committed birders drove an average of 2,700 miles for birding trips. (USDI Survey, 1993)
- In fact, in a 1990 survey, twice as many vacationers preferred to watch birds than play golf! (Fortune, 1990)
- It's no secret that the best spots for bird-watching usually are in rural areas. Less known, however, are details about the significant economic benefits provided to rural

BIRDING ECONOMICS I

- **What is Birding Economics?**
- **Be birder friendly**
- **Facts & figures**
- **Survey form**
- **Birder restaurant**
- **Birding festivals**
- **Feature articles**

MORE INFORMATIC

Download a **PDF file** [763kb] of the article *Popularity of Birding Growing* by H. Ken C and Nancy G. Herbe from the February 20 issue of *Birding*.

Visit the **USFWS wet** for a report on the 2(National Survey of Fi Hunting, and Wildlife-Associated Recreatic

communities by birdwatchers and wildlife-viewers. The effect of dollars spent by ecotourists is "multiplied" as tourist dollars become profits, then wages, then consumer income once again, and so on. In some regions, the multiplier effect may be close to 5:1. Consider the following examples:

- **Cape May, New Jersey**: Each year more than 100,000 birders visit this area, contributing to the local economy a cumulative impact of nearly $10 million. (Kerlinger and Wiedner, 1991). 1997 figures show that figure has increased to more than $31 million
- **High Island, Texas:** In 1992, more than 6,000 birders visited this small Gulf Coast town. They spent $2.5 million in the community, and generated for the region a total economic impact of about $6 million. (Eubanks, Kerlinger, and Payne, 1993).
- **Chincoteague National Wildlife Refuge, Virginia:** The cumulative economic benefit provided to the community by wildlife viewers in 1994 was approximately $80 million. (Kerlinger, 1994)
- **Malheur National Wildlife Refuge, Oregon:** More than 50,000 people visit this birding "hot-spot" annually, directly spending about $4 million in the local economy. (Kerlinger, 1994)
- **Hawk Mountain Sanctuary Pennsylvania:** More than 50,000 visitors each year contribute more than $4 million to the local economy. (Kerlinger and Brett, 1990).
- **Grand Island, Nebraska:** At least 80,000 avitourists annually visit this rural community on the Platte River; they spend more than $15 million, and provide to the region a cumulative "roll over" benefit of nearly $40 million. (Lingle, 1991).
- **Point Pelee, Ontario:** Another migration "hot-spot" that attracts more than 57,000 birders each year, who spend almost $4 million in the area.
- **Arizona:** A University of Arizona study revealed that two birding "hot-spots" in southwestern Arizona attracted 38,000 avitourists in 1991, who in turn spent $1.6 million and generated $2.7 million in local economic output, sustaining 56 jobs. (Common Ground, 1993).
- **Texas:** A Texas A&M University study on the Seventh Annual Hummer/bird Celebration in 1995 revealed that spending among non-resident visitors contributed $2.5 million in total gross output in the local community. It contributed 0.8 million in personal income and contributed 73 jobs in the local community. (Kim et al, 1998)

Local Economic Impacts of Birders

Top 12 Birding Sites in North America

1. Southeast Arizona
2. Rio Grande Valley, Texas - Santa Ana NWR - 100,000 - $14 million
3. Everglades, Florida
4. Texas Coast
5. Cape May, New Jersey - 100,000 - $10 million
6. Point Pelee, Ontario - 60,000 (May) - $2 million
7. Big Bend National Park, Texas
8. Point Reyes, California
9. Forsythe/Brigantine NWR, New Jersey
10. High Island, Texas - 6,000 (Spring only) - $2.5 million
11. Hawk Mountain, Pennsylvania - 70,000 - $1.5 million
12. Cheyenne Bottoms or Quivera NWR, Kansas - 17,000 - $1 million -

What Do Traveling Birders Want?

- 1 - Information
  - a - birdfinding guides
  - b - up-to-date checklists (with seasonal & habitat abundance information)
  - c - a daily birding log
  - d - informed interpreters (about local specialties & unusual rarities)
- 2 - Access - roads, trails, boardwalks, blinds, boats, etc.
- 3 - Amenities - bathrooms, shade, escape from insects & extreme temperatures, drinks, food, lodging
- 4 - Value

How Do I Get the Attention of Traveling Birders?

- 1 - Birdfinding Guides & Articles focusing on:
  - a -rare or local species
  - b - unusual congregations of birds
  - c - unusually good viewing opportunities
- 2 - A Birding Festival
- 3 - A Birding Trail

References

- Common Ground May/June 1993. Vol. 4, No. 4, page 3.
- Eubanks, T., P. Kerlinger and R.H. Payne. 1993. "High Island, Texas: A Case Study in Avitourism." In *Birding* 25:415-420.
- Lingle, G.R. 1991. "History and Economic Impact of Crane watching in Central

The Economics of Bird Watching

Measures of Economic Value

Putting a dollar figure on birding can appear a tricky business. How can dollars be used to value something as intangible as the enjoyment of birds and birding? Looked at from a practical perspective we live in a world of competing resources and dollars. Activities such as golfing and industries such as computer software are regularly described in terms of jobs generated and benefits to consumers. The same economic principles that guide the measure of golf and software apply also to birding.

Expenditures by recreationists and net economic values are two widely used but distinctly different measures of the economic value of wildlife-related recreation. Money spent for binoculars in a store or a sandwich in a deli on a trip has a ripple effect on the economy. It supplies money for salaries and jobs which in turn generates more sales and more jobs and tax revenue. This is economic output or impact, the direct and indirect impact of birders' expenditures and an example of one of two economic values presented in this paper. Economic impact numbers are useful indicators of the importance of birding to the local, regional, and national economies but do not measure the economic benefit to an individual or society because, theoretically, money not spent on birding (or golf, or software) would be spent on other activities, be it fishing or scuba diving. Money is just transferred from one group to another. However, from the perspective of a given community or region, out-of-region residents spending money for birding represents real economic wealth.

Another economic concept is birding's economic benefit to individuals and society: the amount that people are willing to pay over and above what they actually spend to watch birds. This is known as net economic value, or consumer surplus, and is the appropriate economic measure of the benefit to individuals from participation in wildlife-related recreation (Bishop, 1984; Freeman, 1993; Loomis et al., 1984; McCollum et al. 1992). The benefit to society is the summation of willingness to pay across all individuals.

Net economic value is measured as participants' "willingness to pay" above what they actually spend to participate. The benefit to society is the summation of willingness to pay across all individuals. There is a direct relationship between expenditures and net economic value, as shown in Figure 2. A demand curve for a representative birder is shown in the figure. The downward sloping demand curve represents marginal willingness to pay per trip and indicates that each additional trip is valued less by the birder than the preceding trip. All other factors being equal, the lower the cost per trip (vertical axis) the more trips the birder will take (horizontal axis). The cost of a birding trip serves as an implicit price for birding since a market price generally does not exist for this activity. At $60 per trip, the birder would choose not to watch birds, but if birding were free, the birder would take 20 birding trips.

At a cost per trip of $25 the birder takes 10 trips, with a total willingness to pay of $375 (area acde in Figure 2). Total willingness to pay is the total value the birder places on participation. The birder will not take more than 10 trips because the cost per trip ($25) exceeds what he would pay for an additional trip. For each trip between zero and 10, however, the birder would actually have been willing to pay more than $25 (the demand curve, showing marginal willingness to pay, lies above $25).

The difference between what the birder is willing to pay and what is actually paid is net economic value. In this simple example, therefore, net economic value is $125 (($50 – $25) 10 ÷ 2) (triangle bcd in Figure 2) and birder expenditures are $250 ($25 × 10) (rectangle abde in Figure 2). Thus, the birder's total willingness to pay is composed of net economic value and total expenditures. Net economic value is simply total willingness to pay minus expenditures. The relationship between net economic value and

Figure 2. Individual Birder's Demand Curve for Birding Trips

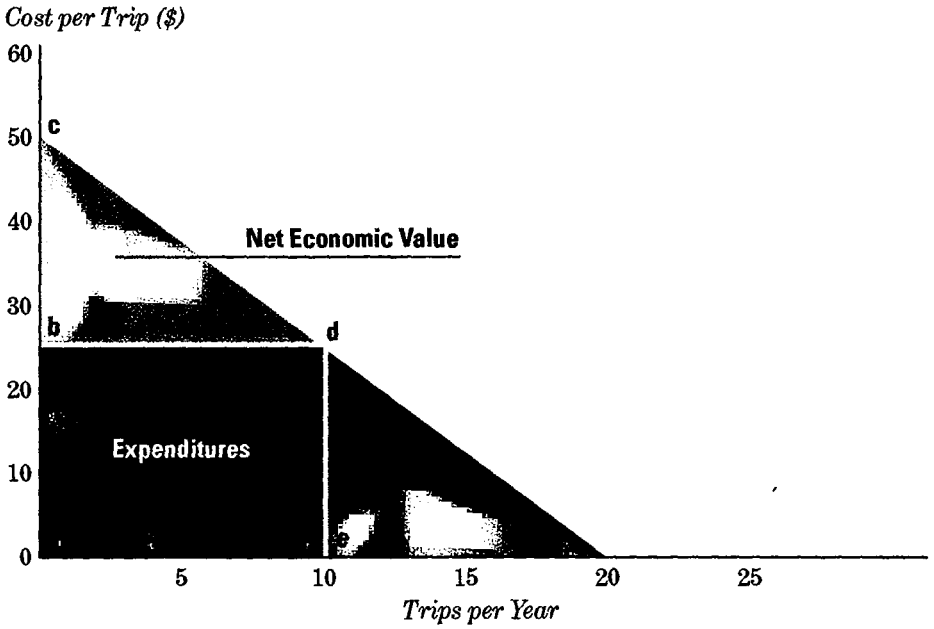


Table 9. Birders' Expenditures for Wildlife Watching: 2001
(Population 16 years of age and older. Thousands of dollars.)

Expenditure item	*Expenditures ($)*
Total, all items	**31,686,673**
Trip-Related Expenditures	
Total, trip-related	7,409,679
Food	2,646,224
Lodging	1,851,206
Public transportation	682,202
Private transportation	1,790,951
Guide fees, pack trip or package fees	110,374
Private land use fees	48,999
Public land use fees	108,414
Boating costs	135,381
Heating and cooking fuel	35,928
Equipment and Other Expenses	
Total, equipment and other expenses	24,276,994
Wildlife-watching equipment, total	6,010,141
Binoculars, spotting scopes	471,264
Cameras, video cameras, special lenses, and other photographic equipment	1,431,807
Film and developing	837,868
Bird food	2,239,259
Nest boxes, bird houses, feeders, baths	628,060
Daypacks, carrying cases and special clothing	288,648
Other wildlife-watching equipment (such as field guides, and maps)	113,235
Auxiliary equipment, total	523,700
Tents, tarps	163,999
Frame packs and backpacking equipment	121,217
Other camping equipment	238,835
Other auxiliary equipment (such as blinds)	117,267
Special equipment, total	11,158,302
Off-the-road vehicle	5,512,624
Travel or tent trailer, pickup, camper, van, motor home	4,657,752
Boats, boat accessories	946,688
Other	41,238
Magazine	297,780
Land leasing and ownership	4,197,666
Membership dues and contributions	808,101
Plantings	639,986

Facts-at-a-Glance

46 *Million Birders*

$32 *Billion in Retail Sales*

$85 *Billion in Overall Economic Output*

$13 *Billion in State and Federal Income Taxes*

863,406 *Jobs Created*

expenditures is the basis for asserting that net economic value is an appropriate measure of the benefit an individual derives from participation in an activity and that expenditures are not the appropriate benefit measure.

Expenditures are out-of-pocket expenses on items a birder purchases in order to watch birds. The remaining value, net willingness to pay (net economic value), is the economic measure of an individual's satisfaction after all costs of participation have been paid.

Summing the net economic values of all individuals who participate in an activity derives the value to society. For our example let us assume that there are 100 birders who bird watch at a particular wildlife refuge and all have demand curves identical to that of our typical birder presented in Figure 2. The total value of this wildlife refuge to society is $12,500 ($125 × 100).

Birders' Expenditures and Economic Impact

Birders spent an estimated $32 billion (see Table 9) on wildlife-watching in 2001. This estimate includes money spent for binoculars, field guides, bird food, bird houses, camping gear, and big-ticket items such as boats. It also includes travel-related costs such as food and transportation costs, guide fees, etc.

When using the numbers in Tables 9 and 10 it is important to know that these dollar figures represent the money birders spent for all wildlife-watching recreation — not just birding. The 2001 Survey collected expenditure data for people who fed, photographed, or observed wildlife. Expenditure data was not collected solely for birding. It is possible that people who watched birds in 2001 may have spent money on other

Table 10. Economic Impact of Birders: 2001*
(Population 16 years of age and older.)

Retail Sales (expenditures)	$31,686,673,000
Economic Output	$84,931,020,000
Salaries and Wages	$24,382,676,000
Jobs	863,406
State Income taxes	$4,889,380,000
Federal Income taxes	$7,703,308,000

* Amount that birders spent on all wildlife watching.

types of wildlife-related recreation such as binoculars for whale-watching or gas for a moose-watching trip rather than only bird-watching. Therefore, these estimates for birding expenditures may be overestimates.

This $32 billion that birders spent generated $85 billion in economic benefits r the nation in 2001. This ripple effect on the economy also produced $13 billion in tax revenues and 863,406 jobs. For details on economic impact estimation methods see Appendix A.

The sheer magnitude of these numbers proves that birding is a major economic force, driving billions in spending around the county. On a local level, these economic impacts can be the life-blood of an economy. Towns such as Cape May, New Jersey, and Platte River, Nebraska, attract thousands of birding visitors a year generating millions of dollars — money that would likely otherwise be spent elsewhere.

Estimated Net Economic Values
As stated earlier, the willingness to pay above what is actually spent for an activity is known as net economic value. This number is derived here by using a survey technique called contingent valuation (Mitchell and Carson, 1989). Respondents to the 2001 Survey were asked a series of contingent valuation (CV) questions to determine their net willingness to pay for a wildlife watching trip. *Please note that the data presented here are net economic values for wildlife watching trips — not for bird watching trips solely.* However, since the vast majority of away-from-home wildlife watchers are birders (84 percent), the values presented here are acceptable for use in valuing birding trips. For details on net economic value estimation methods please see Appendix A.

As seen in Table 11, the net economic value per year for a wildlife watcher in their resident state is $257 per year or $35 per day. Wildlife watchers who travel outside their state have a different demand curve (they generally take fewer trips and spend more money) and therefore have their own net economic values of $488 per year and $134 per day.

When and how can these values be used? These numbers are appropriate for any project evaluation that seeks to quantify benefits and costs. They can be used to evaluate management decisions (actions) that increase or decrease participation rates. In a simple example, if a wildlife refuge changed its policies and allowed 100 more birders to visit per year, the total value to society due to this policy change would be $25,700 ($257 × 100) per year (assuming all visitors are state residents). This value, however, assumes that these 100 birders could and would watch birds only at this refuge and that they would take a certain number of trips to this refuge. In a more realistic example, if the refuge changed its policy and stayed open two more weeks a year and knew that 100 people visited each day during this period then the benefit to society could be estimated by multiplying the number of people by days (100 × 14) by the average value per day ($35) for a total of $49,000. If the refuge had data on the number of in-state and out-of-state visitors then the numbers could be adjusted to reflect their appropriate value.

Net economic values also can be used to evaluate management actions that have a negative affect on wildlife watching. For example, if a wildlife sanctuary was slated for development and birders were no longer able to use the site, and if the sanctuary manger knew the number of days of birding over the whole year (e.g, 2,000 days) it is possible to develop a rough estimate of the loss from this closure. This estimate is accomplished by multiplying net economic value per day ($35) by the days of participation (2,000) for a value of $70,000 per year.

Two caveats exist to the examples above: (1) if bird watchers can shift their birding to another location then the values are an over-estimate; and (2) if a loss of wildlife habitat causes an overall degradation in the number of birds and in the quality of birding then the values are an under-estimate.

Table 11. Net Economic Values for Wildlife Watching: 2001
(Population 16 years of age and older.)

	Net economic value per year	*Standard error of the mean*	*95 percent confidence interval*	*Net economic value per day of birdwatching*	*Standard error of the mean*	*95 percent confidence interval*
State Residents	$257	12	$233 – 282	$35	2	$32 – 39
Nonresidents	$488	37	$415 – 561	$134	12	$110 – 158

U.S. Fish & Wildlife Service

News Release

November 12, 2003

Birdwatching is Big Business!

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Contacts

Bruce Woods (907) 786-3695

A recent U.S. Fish and Wildlife Service publication reports that 46 million birdwatchers across America spent $32 billion in 2001 pursuing one of the NationTs most popular outdoor activities. The report, *Birding in the United States: A Demographic and Economic Analysis*, is based on data collected during the 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

The report defines a birder as an individual who travels a mile or more from home for the primary purpose of watching birds, or closely observes or tries to identify birds around the home. Those who simply enjoy spotting birds while mowing the lawn or picnicking at the beach were not counted as birders. Trips to zoos and observing captive birds also did not count as birdwatching. Watching birds near home is the most common form of birding. However, 40 percent (18 million) of all birders reported that they also travel to pursue their enthusiasm.

"This report tells us that more than a third of all Alaska residents are birdwatchers," said the ServiceTs Alaska Regional Director Rowan Gould. "In fact, on a per capita basis, only Montana and Vermont have more birders than Alaska has! More impressive still, almost half of the active birders that pursue their activity in Alaska are visitors to our state. This report underscores the economic importance of birdwatching to Alaska, and demonstrates exactly why itTs essential that we continue to work with our partners to restore and protect habitat to ensure healthy bird populations. This is especially clear in light of the reportTs finding that fully 83% of nonresident birders do some or all of their birdwatching on AmericaTs

public lands, many of which are part of the National Wildlife Refuge System."

Nationally, birders spent $32 billion on gear, travel, food, and big ticket items such as canoes and off-road vehicles. This spending generated $85 billion in overall economic output, including $13 billion in federal and state income taxes, and supported more than 863,000 jobs. Nationwide, the net economic value of each nonresident birder is estimated to be $488 per year. Using that figure to calculate the contribution of the 157,290 birdwatchers who visit Alaska each year, the estimated economic value of nonresident birders to the state economy is a staggering $76,757,520.

Of course, thereTs no mystery as to why public lands in the Last Frontier are so popular with bird enthusiasts. All of AlaskaTs 16 National Wildlife Refuges provide world class birding opportunities. From the trails and boardwalks on Tetlin and Kenai National Wildlife Refuges to the remote waterways of Yukon Flats or Kanuti to the Kachemak Bay Shorebird Festival, which the Homer Chamber of Commerce and Alaska Maritime Wildlife Refuge sponsor each year with the help of numerous other partners, our public lands are rich in birding opportunities, and offer the chance to observe species that are rare or impossible to find elsewhere in America. Even in urban Anchorage, last yearTs International Migratory Bird Day event, co-sponsored by the Anchorage Zoo, the Alaska and Anchorage Audubon Societies, KTUU-TV, and Bird Treatment and Learning Center, attracted almost 2000 people.

Other interesting facts about the impact of birding on Alaska include:

> The Alaska Bald Eagle Festival, which will be held this year near Haines, Alaska, attracts upwards of 250 raptor fans each year. The 2003 event will run from November 12-16. Call (907) 766-3094 for information.
>
> The Alaska Waterfowl Calendar, a project which encourages rural students to study waterfowl that occur near their homes and then submit either a piece of writing or a drawing to be published in the annual calendar, involved 56 villages last year, and drew 377 articles and 1559 pieces of artwork. Contact Cathy Rezabeck at (907) 786-3351 for information, or check out the website at

(http://alaska.fws.gov/ExternalAffairs/Education/GooseCalendar/).

> AudubonTs Christmas bird counts last year involved almost 900 winter-hardy birders participating in 34 counts across the state. Contact your local Audubon office for information on this yearTs event in your region, or locate your area contact person online at

(www.absc.usgs.gov/research/bpif/cbc/cbc.contributors.html).

The State of Alaska is doing its bit to encourage birdwatching. A recently unveiled program called "Wings Over Alaska" (http://www.wildlife.alaska.gov/viewing/wings/wings_hm.cfm) offers a series of awards for birders able to identify 50, 125, 200 and 275 species of birds in the state.

Bird tourism brings in big bucks! Vacationing bird watchers pay upwards of $3,500 apiece for birding adventures, primarily cruises, in Alaska. To generate a list of such adventures, visit the Alaska Wilderness Recreation Travel Association website (http://www.awrta.org/plantrip.cfm) and use the search function to explore birding vacation opportunities across the state.

Even in little Tok, MayTs Upper Tanana Migratory Bird Festival, sponsored by the U.S. Fish and Wildlife Service, in partnership with the local Chamber of Commerce, school district and area businesses, has drawn nearly 800 birdwatchers annually in past years. Contact Tetlin National Wildlife Refuge (907) 883-5312 for information.

The Alaska Junior Duck Stamp Program, an integrated art and science curriculum developed to teach environmental science and habitat conservation to schoolchildren, drew 1108 entries last year, with 72 teachers participating. Contact Shannon Nelson or Jennifer Reed at (907) 456-0440 for information on how to participate, or visit the website at (http://alaska.fws.gov/jrduck/index.htm).

General information about birding events in Alaska can be found on the American Bird CenterTs "Bird Watching Alaska" website (www.americanbirdcenter.com/abc-alaska.htm).

This growing awareness of birding comes at what might be seen as exactly the right time. According to a 2003 USGS publication (Sauer, Hines and FallonTs *The North American Breeding Bird Survey, Results and Analysis*) almost one in four bird species in the United States showed significant declines in population between 1966 and 2002, and these losses can be attributed primarily to the degradation and destruction of habitat. Perhaps the evidence of the economic value of birdwatching detailed in *Birding in the United States: A Demographic and Economic Analysis* will provide the impetus needed to help reverse that trend.

The full report is available on-line at (http://library.fws.gov/nat_survey2001_birding.pdf). Information about "Banking on Nature," a companion report calculating the economic value of National Wildlife Refuges to local communities can be found at

(http://news.fws.gov/newsreleases/r9/081A6A70-B580-4C10-B32894DF2C1CE4D0.html).

The U.S. Fish and Wildlife Service is the principal federal agency responsible for conserving, protecting, and enhancing fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The Service manages the more than 95-million-acre National Wildlife Refuge System, which encompasses 542 national wildlife refuges, thousands of small wetlands and other special management areas. It also operates 69 national fish hatcheries, 64 fishery resource offices, and 81 ecological services field stations. The agency enforces federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat such as wetlands, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program that distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state fish and wildlife agencies.

- FWS-

For more information about the U.S. Fish and Wildlife Service,visit our home page at http://www.fws.gov

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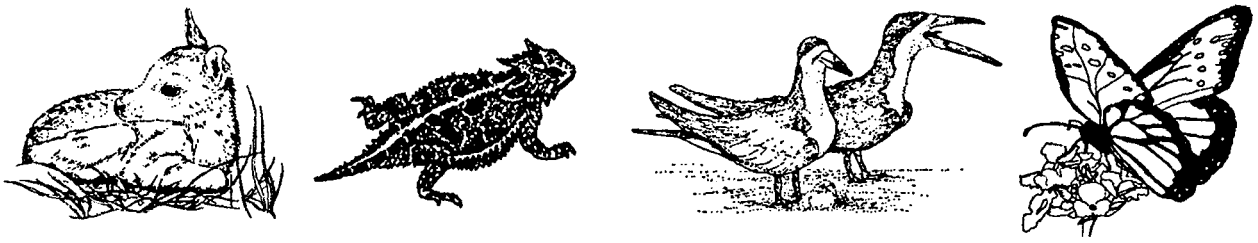
TEXAS PARKS AND WILDLIFE

Nature Tourism in Texas



Texas Parks and Wildlife - August 2001

- Travel spending by all domestic and international visitors in Texas reached $36.7 billion in 1999. This represents a 7.6 percent increase over 1998. Nature-based tourism is a fast growing segment of this growing tourism industry. [1]

- Nature tourism can be defined as discretionary travel to natural areas that conserves the environmental, social and cultural values while generating an economic benefit to the local community. Interest in nature tourism is growing in Texas as rural communities look for ways to diversify local economies and landowners look for ways to diversify agricultural income. [2]

- According to a 1996 survey by the Fish and Wildlife Service, wildlife-associated recreation (fishing, hunting, wildlife viewing) contributed 5.5 billion to the Texas economy. [3]

- Texas is a diverse state with abundant natural resources and wildlife. For example, Texas has 620 documented species of birds, more than any other state. The Lower Rio Grande Valley has 294 species of butterflies, 40% of species recorded in North America north of Mexico.

- The number of people in the United States 16 years of age and older that participate in birdwatching has grown from 21 million in 1983, to 54 million in 1995, and to 68 million in 2000. [4]

- The percentage of the United States adult population that views or photographs birds (32.8), other wildlife (42.8), wildflowers and natural vegetation (45.2), and natural scenery (54.8) ranges from about 33 to 55 percent. [4]

- Nature tourism brings dollars to Texas.
  - In 1999, travelers on the central coast portion of the Great Texas Coastal Birding Trail devoted an average of 31 days per year viewing wildlife on the trail. They spent an average of $78 per person per day while traveling along the trail, resulting in a direct expenditure of $2,452 during the past twelve months. [5]

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[1] Dean Runyan Associates. The Economic Impact of Travel on Texas 1999. Texas Department of Economic Development.
[2] Nature Tourism in the Lone Star State - Economic Opportunities in Nature. A Report from the State Task Force on Texas Nature Tourism. 1994.
[3] 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, U.S. Fish and Wildlife Service, Division of Economics, 1997.
[4] National Survey on Recreation and the Environment 2000. USDA Forest Service and USDC, NOAA.
[5] Eubanks, Ted and John Stoll. 1999. Avitourism in Texas: Two Studies of Birders in Texas and Their Potential Support for the Proposed World Birding Center. Texas Parks and Wildlife Contract No. 44467.

- In 1995, birdwatchers visiting Santa Ana NWR, Laguna Atascosa NWR, and Sabal Palm Audubon Sanctuary contributed over $59 million in direct expenditures to the Lower Rio Grande Valley. [6]

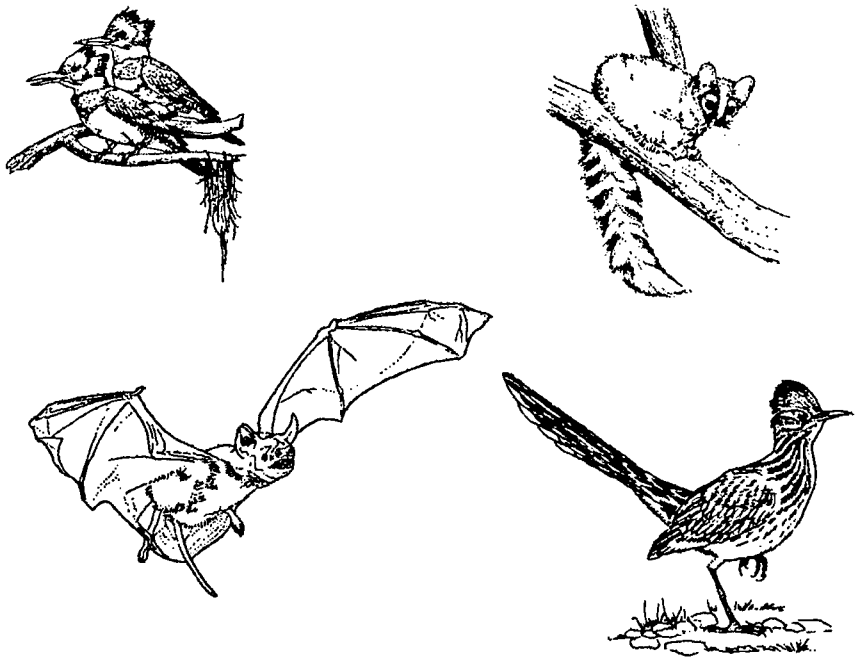
- Nature tourists visiting the HummerBird Festival in Rockport, Texas contributed $1.4 million in direct expenditures to the local economy in 1995. [7]

- Visitors to the High Island Audubon Sanctuary in 1992 contributed at least $2.5 million to the economy of the upper Texas coast. [8]

❖ Nature tourism provides incentives for local communities and landowners to conserve wildlife habitats upon which the industry depends – it promotes conservation by placing an increased value on remaining natural habitats.

❖ Nature tourism development in rural communities can diversify local economies, while also providing benefits to the people who live there. Some benefits are economic (local tax revenues were $623 million in 1999 [1]); others have to do with instilling pride in community and providing jobs for residents.

❖ Nature tourism in Texas provides incentive for habitat conservation, promotes sustainable economic development, and builds broad-based public support for wildlife conservation.



[6] Kerlinger, Paul, T. Eubanks and R.H. Payne. 1995. The Economic Impact of Birding Ecotourism on the Laguna Atascosa NWR, Santa Ana NWR, and Sabal Palm Audubon Sanctuary, Texas.
[7] Scott, David. 1995 The 1995 Rockport HummerBird Celebration: A Survey of Visitors. The Trull Foundation and Texas A&M Department of Recreation, Park and Tourism Sciences.
[8] Eubanks, T., Kerlinger, P. and R.H. Payne. 1993. High Island, Texas: Case Study in Avitourism. Birding, Vol. XXV: Number 6. American Birding Association, Inc.

For more information, contact Linda Campbell, Nature Tourism Coordinator, 512-389-4396 or Linda.Campbell@tpwd.state.tx.us
PWD LF W7000-1069

The Dibbler, *Antechinus apicalis*, on the blossom of *Banksia attenuata*

--Photo M. K. Morcombe.

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THE REDISCOVERY AFTER 83 YEARS OF THE DIBBLER *ANTECHINUS APICALIS* (MARSUPIALIA, DASYURIDAE)

By M. K. MORCOMBE, Box 54, Armadale.

INTRODUCTION

The carnivorous marsupial *Antechinus apicalis* (Grey, 1842) has not been collected for at least 83 years and consequently has been considered possibly extinct (Glauert, 1933). Quite apart from its rarity it is also a species of scientific interest because of disagreement about its classification: Tate (1947) erected a monotypic genus, *Parantechinus*, for this species, based on the extreme reduction of the posterior premolars which are single-rooted vestiges. Ride (1964) in describing a new dasyurid species *A. rosamondae*, with even more extreme premolar reduction, has commented on the taxonomy of *Antechinus*, *Parantechinus* and *Pseudantechinus* and suggests a return to the wider concept of *Antechinus* for all species of this group.

I obtained two specimens of *Antechinus apicalis* near Cheyne Beach, 30 miles east of Albany, Western Australia, by trapping on the flowers of *Banksia attenuata*. The first, a female, was caught on the night of January 26, 1967, and this specimen, with a male caught two nights later, has been kept alive to the time of writing (March 30) for observations on behaviour.

REDISCOVERY

Between January 12 and 31, 1967 trapping was carried out in the Albany district and eastwards with the primary objective of collecting a live specimen of the Honey Possum, *Tarsipes*, which is well known to be associated with *Banksia* and other large wild-flowers.

Traps were made to fit over these flowers. Several versions of trap were made, and the most satisfactory seems to be a cylinder of flywire stiffened with a medium thickness fencing wire. One end is closed permanently, the other by a circular door, which is hinged. A mousetrap wired to the outside of the cylinder pulls this door shut, the trip-wire passing from this mousetrap through the centre of the cylinder and being tied to the opposite side. The construction is simple, the cost very low, and a dozen can be made in a few days.

The setting of these traps on flowers is not as conveniently done as the setting of conventional box traps on the ground: a flower with straight, upright stem is needed. The cylinder, over the flower, must be wired to the stem below the flower, and usually braced with wires to nearby branches. Leaves must be removed where they would interfere with the swing of the door. The tight fit of the door around the stem is usually a problem. The door must have a notch to fit the branch, and though the cages may be made to a pattern, banksia branches are not, and

Queensland. Ride *(pers. comm.)* agrees with Thomas's (p. 278 footnote) that these cannot be separated from *A. api* s on their morphology; although Ride has some reservations ecause he has not compared them with other juveniles of *A. apicalis*.

(2) From literature.

Gilbert's notebook on the marsupials (Whittell, 1954) includes entries in his own handwriting, on species he had collected, and there is an entry (giving native names) for three localities for this species:

"Antechinus

Marn-dern, Aborigines of Moore's River

Wy-a-lung, Aborigines of Perth

*Dib-bler, Aborigines of King George's Sound"

and "Hab: Western Australia. No. 2 of my collection."

His only notebook specimen mentioned with locality, was from Albany: "While at the Sound I obtained a female with seven young attached in the same manner as observed in *A. leucogaster*."

Gilbert's letter to Gould, March 27, 1843 (Gilbert in Wagstaffe and Rutherford, 1955: 17) mentions another specimen:

"No. 2 Phascogale? Mara-dera Aborigines of Moore's River.

The only part of the Colony I have observed this animal and the only specimen I received procured from Moore's River in the interior." (The name Moore's River was used by Gilbert for the part of the Moore River in the vicinity of the present New Norcia. Ride, *pers. comm.)*

Gould also in the introduction to *The Mammals of Australia* (1863) says:

"Mr George French Angas having sent me a skin of this animal from South Australia, I am enabled to state that its range extends from Western Australia to that colony." Ride *(pers. comm.)* has been unable to trace that specimen, and the species is not mentioned by Wood Jones (1923) in *The Mammals of South Australia.*

(3) Fossil Records.

Lundelius (1957) has added to collectors' information on locality for a number of mammals including *Antechinus apicalis*. He considers the fossil assemblage of the top foot and surface in caves along the west and south coasts of W.A. "to represent the fauna of those areas before the effect of introduced species was felt." He recorded *Antechinus apicalis* "in caves along the west coast from Yanchep to Jurien Bay. It appears to have occupied a strip of country along the coast as far south as Yanchep, then inland to Albany skirting the high rainfall area of the South-West corner. No remains are known from the Margaret River caves."

Lundelius (1960) records *A. apicalis* near Jurien Bay, from Drovers Cave, four miles inland from the bay and 130 miles north of Perth, in deposits to a depth of 5 feet; and from Wedge Cave one mile north-west of Mimegarra homestead, 100 miles north of Perth, to a depth of 8½ feet in the deposits.

* As printed in Whittell's article the word appears as "Dib-bier" not "Dib-bler," an error which has caused press releases of this present rediscovery to have been issued under the name Dibbier, on the assumption that Gould had erred and subsequent works, such as Glauert's (1928) "official" list of popular names, had copied the error. The Director of the Queensland Museum has now confirmed from Gilbert's notebook that the original spelling of the native name is "Dib-bler."

The species was not recorded from the Mammoth or Nannup caves, both ne Witchcliffe in the extreme south-west of Western Australia, no as it among fossils from six caves located on the southern edge of the Nullarbor Plain (Lundelius, 1963).

PREVIOUS RECORDS OF BEHAVIOUR AND ECOLOGY

There are very few records of the behaviour and ecology of *Antechinus apicalis*, so those known are quoted in full.

(1) From Gilbert's Notebook (Whittell, 1954).

"This species is universally dispersed over the whole of Western Australia; it is easily distinguished from all others of the Genus by the long hairs on the sides of the basal portion of the tail giving the tail a pointed appearance. It appears to vary a good deal in habits in different localities. At Moore's River the natives describe it as making a nest beneath the overhanging grasses of Xanthorrhoea. While at Perth its nest is taken either from the dead stump or from among the upper grasses of the same plant, while at the Sound the natives constantly pointed out a nest of short pieces of sticks and grasses on the ground very much resembling the common **Perameles** excepting that there was in general a larger and higher heap than is generally brought together by the latter. On examining the stomach it was found to contain insects generally, but more particularly small Coleoptera. While at the Sound I obtained a female with seven young attached in the same manner as observed in **A. leucogaster.** These young were little more than half an inch in length, the hinder parts remarkably small, as compared with the anterior extremities. The young are very tenacious of life in the above instance the young lived attached to the dead mother for nearly two days before they were removed when they were rather forcibly detached, I put them in spirits, and it was nearly two hours after immersion before they ceased moving.

Hab: Western Australia. No. 2 of my collection."

(2) From Gilbert's letter to Gould from Perth, March 27, 1843 (in Wagstaffe and Rutherford, 1955).

"It was brought to me by a native, who said he had captured it in a nest formed in a slight hollow in the ground, and under the shelter of a Xanthorrhoea. My specimen is a female; its mammae were four in number, and bore the appearance of having had as many young ones attached which were probably torn off by the Native in catching it. J. Drummond informs me that the Male is much larger. He has a specimen which he has promised me."

OBSERVATIONS ON THE ECOLOGY AND BEHAVIOUR OF *ANTECHINUS APICALIS*

(1) In the wild.

The capture of two specimens of this species, both on banksia flowers, suggests some dependence upon the larger wildflowers so common on these coastal sandplains, for nectar and for insects. (Night examination of these banksia flowers revealed copious nectar, and insect life far more abundant than by day: great numbers of minute insects, and crickets, spiders, several olive-green centipedes, and on one flower, a sleeping emu-wren, *Stipiturus malachurus*, which was easily caught in the hand.)

It seems that the banksias not only provide water as nectar (for which they are visited also by the Honey Possum and *Rattus fuscipes)* but also attract predatory insects, spiders and centipedes which in turn would be an added attraction for any small carnivorous marsupial such as *Antechinus apicalis.*

Conversely it is suggested that the very small insects that are present in great numbers within the tangled mass of banksia flowers, well below the sites of pollen transfer, could but rarely pollinate these flowers, but serve well as an added attraction for the honeyeating birds and for the small marsupials whose probing of the flowers must be equally effective in pollination.

The site of capture suggests *Antechinus apicalis* is partly arboreal. Observation of behaviour in captivity supports this.

it is usually necessary to bend and shape the cage and its door a little to fit each branch. The tripwire passes over the surface to the flower.

Until January 22 these traps, up to ten in number, were set on flowers of *Banksia attenuata* and *Banksia grandis* scattered through a dense thicket of *Banksia coccinea* near Oyster Harbour, Albany. The only mammal collected here was one specimen of *Rattus fuscipes*, an attractive small native species, which was taken in a trap set over a flower approximately twelve feet above ground.

On January 23 all traps were shifted 28 miles east of Albany to the Upper Kalgan district where they were set for one night without result.

On January 24 six traps were set for one night on flowers of stunted *B. attenuata* in low heath vegetation along the road between the Waychinicup River and Cheyne Beach, 30 miles east of Albany, but without result. However, two small mammals were seen here: one in the talons of a low-flying Brown Hawk, *Falco berigora*, and the other running through low vegetation—the impression gained was of rat rather than marsupial.

All traps were shifted, next, to a site between Cheyne Beach and Lookout Point on January 25 between 50 and 100 yards from the fishing settlement, and again set on *B. attenuata* flowers. On the morning of the 26th the sole occupant of the traps was a *Rattus fuscipes*, caught on a flower five feet above ground. However on the morning of January 27 a trap set perhaps two feet above ground held a small marsupial, a female of *Antechinus apicalis*.

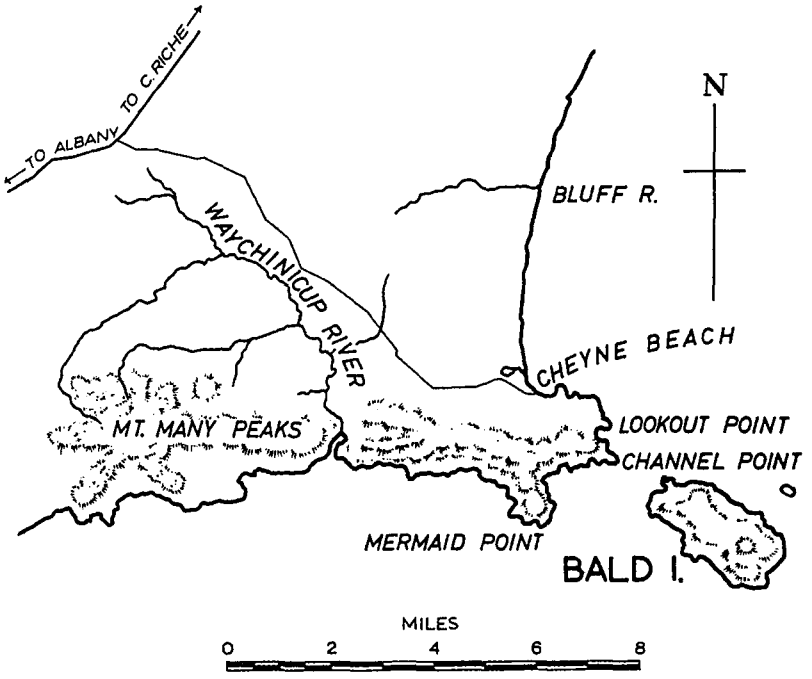

Fig. 1.—Map of the Mt. Many Peaks-Cheyne Beach area.
—After G. M. Storr.

The vegetation here consisted of stunted *Banksia attenuata* to a height of about six feet; dense clumps and shrubby bushes of *B. baxteri* to eight or ten feet; extensive clumps of the Peppermint, *Agonis*, and dense undergrowth of low, tangled scrub to perhaps two feet.

On the morning of January 29 a trap on a flower four feet above ground held a second, larger *Antechinus apicalis*, a male. A nearby trap contained another specimen of *Rattus fuscipes*. The trapping was then discontinued.

PREVIOUS BIOLOGICAL STUDY OF THE CHEYNE BEACH AREA

The area around Cheyne Beach and Mt. Many Peaks is little known zoologically. In 1959 a party from the Zoology Department of the University of Western Australia spent a week exploring the countryside around Cheyne Beach prior to crossing to nearby Bald Island to collect live Quokkas and to study the flora and fauna (Storr, 1965). Mammals and birds of the areas east, west and inland of Cheyne Beach were recorded. Among the mammals, *Rattus fuscipes* was plentiful in the sandplain near Cheyne Beach and three were caught in box traps placed on the ground at the entrances of burrows (G. M. Storr *pers. comm.*). *Antechinus apicalis* was not collected, nor were bones of this species among others collected in a cave near Waychinicup estuary.

PREVIOUS RECORDS OF LOCALITY

(1) From museum specimens.

The British Museum (Natural History) has several specimens (see Thomas, 1888: 278). All but one of these were registered in the 1840's, and almost certainly came from Gould's collector, Gilbert; these two specimens, which may be from the same individual (a skin 44.9.30.6 and a skull 48.1.27.2) are from a precise locality i.e. Victoria Plains,* Western Australia. The other (No. 86.9.1.1) was registered in 1886 and was purchased from Gerrard who gave Albany as the locality (Ride, *pers. comm.)*

City of Liverpool Museum. A specimen No. 272a, J. Gould Collection; original collector's label still attached, "July 3, 1843 Vicinity of Moore R. Western Australia."

Rijksmuseum v. nat. Hist. Leyden: two specimens, one purchased in 1844, with Moore's River as locality; the other with no data or precise locality (Jentink, 1888).

The Australian Museum, Sydney has one specimen (No. 601) collected in ?1869 at the Salt River, W.A. (i.e. the Pallinup R. about 60 m. east of Albany). This is probably the specimen collected by Masters in 1869 (see list in Glauert, 1950: 126).

The National Museum, Victoria has no specimens with precise locality, but there are 22 in all from Western Australia probably taken between 1875 and 1884.

The Western Australian Museum has no specimen of *Antechinus apicalis*, the specimens collected at Albany by Shortridge in 1904 (Shortridge, 1910) being misidentified specimens of *A. flavipes* (Glauert, 1954).

The Queensland Museum has two juvenile specimens recorded by Thomas (1888: 278) which De Vis says are from Rockhampton,

* Victoria Plains is the name used by Gilbert for the grassy plains approximately 40 miles north of Toodyay and between Toodyay and Wongan Hills in the area called "Victoria" in Arrowsmith's map in Grey, 1841 (Ride, pers. comm.)

(2) **In captivity.**

To the time of writing, the two specimens of *Antechinus apicalis* have been kept in captivity for six weeks on a diet of various insects (predominantly grasshoppers) and spiders and raw meat. Milk and water were taken, both seeming more acceptable if honey was added. Fresh banksia flowers placed in the cage are probed and licked with great enthusiasm.

This *Antechinus* can climb quickly and surely, and is fast along branches and among foliage, and commonly springs from branch to branch, a foot or more. Occasionally, if suddenly disturbed, it will release its grip and drop three feet from the top of its cage, landing with a thud but immediately pushing beneath loose leaf litter. When both rush around the cage in the evening or in the early hours of the morning these jumps and drops from heights are common, almost constant, at the peak of their activity.

A. apicalis grasps slender branches or twigs by separating the thumb and first digit from the other three and holding the stem between them. On larger stems or trunks such as *Banksia* the animals appear to gain sufficient traction through their claws and foot surfaces.

The tail serves as a balance and prop when climbing vertically or clinging to the rough-textured surface of a banksia flower. The long, stiff, rather harsh fur of the base of the tail is pressed hard against the flower, particularly when the Dibbler has caught an insect and, as is customary, holds it in its hands to eat. Often as the animals descend they curve the tail laterally to press it against twigs and stiff leaves, and this seems to stabilise their swift descents.

Fresh flowers of *Banksia* placed in their cage are immediately investigated: the Dibblers probe and lick among the rows of

Fig. 2.—The Dibbler feeding in captivity. Insects are held in the paws to be eaten; spiders, however, are buffetted and disabled first.

—Photo M. K. and I. M. Morcombe

massed flowers, giving the impression that they are very familiar with these flowers and their nectar or insect contents.

Insects when offered are grabbed in the forepaws and held while eaten, the first quick bites being always directed at the head. Large spiders and other potentially dangerous prey are not immediately grasped, but are dealt several quick, buffeting blows before being snatched up and given a quick bite, to be dropped, snatched up again, given another quick bite or two, dropped again, and then eaten or further disabled. The whole action would occupy perhaps one second.

In captivity this marsupial is not entirely nocturnal. It is most active early in the morning, but the leaps and the running slow down as the sunlight's warmth and glare increases, until by ten or eleven both Dibblers have pushed beneath the loose leaves thick on the floor of the cage, where they sleep until near sunset. Again they are very active until nine or ten p.m., then seem to sleep much of the night (becoming active if lights are turned on for a while) but are always dashing around their cage by 5 a.m. as the sky lightens with approaching dawn.

On one occasion the male was seen sunning himself when sunlight reached into one corner of the cage. This habit may be more frequent in winter or in the much cooler summer days of the south coast.

A. apicalis in captivity seeks shelter and moves about under loose leaf litter where it lies thickest on the ground; in bright light the animals will not climb, but they will move around on top of the litter, the slightest disturbance sends them beneath the litter in which they burrow by forcing themselves through with considerable violence to emerge at some other point. By continuous use of the one hiding place, something of a chamber is formed among the mass of leaves and fine twigs; paper tissues have also been shredded and incorporated into the walls and the entrance remains open. It is probable that the activity concentrated in a nesting area would also result in a slight hollow in loose soil, probably by continued usage and burrowing under the mass of litter. Such a hiding place would well fit the description of a nest given in Gilbert's letter to Gould.

A NEW DESCRIPTION, LIVING SPECIMENS

The most striking feature of *A. apicalis* is the clear white ring around each eye. This eye ring of near-white fur is very conspicuous. Under conditions of subdued (shade) lighting (as in a room lit by window light) it is still visible from at least fifteen feet if the animal is not moving quickly.

Distinctive also is the tail, which tapers sharply but uniformly in its 3½ inch length from a width of ⅝ inch at the base to quite a fine point. This strong taper is not only due to the longer fur towards the base but also to a considerable taper of the underlying tissues.

The speckled colour of the fur is obvious. Each hair is tipped white. These hairs are of a medium, neutral grey for the 4 to 5 mm. nearest the body; distinctly reddish for the next 4 to 5 mm., and tipped pure white for the outermost 3 mm. These white tips stand out against the underlying dark red-grey, giving this species its characteristic freckled colouration. I found it possible to distinguish the white flecks without difficulty at six feet in subdued (shade) lighting. At greater distances (or when moving quickly) this marsupial appears more uniformly grey to grey-brown; in direct sunlight it appears light grey from a distance.

The speckled colouration of *Antechinus apicalis* extends from the vicinity of the eyes to the tail tip, where it is almost lost in