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A REPORT TO THE MONKEY MIA RESERVE MANAGEMENT COMMITTEE:
RECOMMENDATIONS FOR A FEEDING STRATEGY FOR THE DOLPHINS
OF MONKEY MIA, SHARK BAY

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A summary of recommendations

1. The Monkey Mia dolphins be hand-fed no more than 33% of their basal daily nutritional requirements.
2. Fluctuations in the needs of the dolphins above their basal daily nutritional requirements be compensated for by the dolphin, not by any increase in hand-fed fish.
3. Accurate records of daily and monthly food intakes be maintained for each dolphin by the Dolphin Information Centre rangers.
4. The Dolphin Information Centre be provided with sufficient facilities such as sinks, buckets, scales, thermometers and antibacterial agents to safely provision the dolphins with the fish.
5. The practise of feeding dolphins from any source other than via the Dolphin Information Centre be ceased.
6. The type and quality of fish to be fed to the dolphins be subject to strict control. Only fish normally found in the Shark Bay region should be used.
7. The method of delivering the fish to the dolphins be continued broadly as is practiced now, with minor changes detailed in this report.
8. The dolphin feeding strategy be subject to regular review.
9. Comments and recommendations on boating regulations, dogs and the hovercraft are contained in the report.

Introduction

This report has been produced in response to a request from Dr Barry Wilson and Mr Ron Shepherd of Conservation and Land Management (CALM), under the terms of a consultancy agreement between CALM and myself, for me to make a three day visit to Monkey Mia to assess and make recommendations on the fish feeding policy for the Monkey Mia dolphins.

My advise and recommendations are based on sound biological parameters as well as detailed discussions with Sharon Gosper, the Senior Ranger at the Dolphin Information Centre, and Ron Shepherd, the District Manager of the Shark Bay region. Sharon's experience has been enormously useful, and infact in the absence of formal guidelines for the feeding of the dolphins Sharon, and others, have developed a very sound feeding schedule. Naturally, this system can be improved, the details of which are contained in this report.

During my visit I was also asked to take part in a flight to view and assess the activities of the hovercraft that operates between Carnarvon and Monkey Mia. My advise was also sought on a range of other matters during the visit, the details of which are contained in the report.

2 The feeding of the Monkey Mia dolphins

2.1 A brief history

The interaction between dolphins and humans at Monkey Mia has always involved an unquantified element of feeding. In the early days the fishermen fed the dolphins with discarded fish trapped in nets, however, as the unique character of Monkey Mia became more widely known more and more people visited this isolated location and participated in the shore feeding of the wild dolphins. The past owners of the Monkey Mia caravan park, Wilf and Hazel Mason, were probably the first people to recognise the possible threat that an uncontrolled increase in visitor numbers, all of whom expected to feed the dolphins, posed to the dolphins. The Dolphin Welfare Foundation was formed and the Masons did all they could to educate the human visitors to the area on how best to interact with the wild dolphins. At this stage, in order to support the foundation and ensure that the public had access to fish to feed the dolphins, the sale of frozen fish began.

The sale of fish for dolphin feeding marked a major change for the Monkey Mia dolphins. It firstly meant that the major source of food did not come from the relatively stable number of local fishermen, but rather came from an ever increasing number of enthusiastic visitors. Furthermore, it meant that the fish was not fresh, but rather frozen food, of variable quality, that may or may not have represented species the dolphins were familiar with.

The number of visitors to Monkey Mia continued to increase bringing about a further change from the traditional beginnings of the dolphin feeding. Instead of food being available mainly in the winter months during which most visitation occurred, reasonable numbers of people visited Shark Bay in Summer and thus a continuous supply of fish was available to the dolphins year round. The dolphins, responding to the more regular visitation and more abundant food, began visiting the beaches on an increasing regular basis.

In response to the many increasing demands of Monkey Mia the Dolphin Information Centre started operation in March 1986. The Centre continued to purchase fish from Perth, which in turn was sold to the public and fed, under supervision, to the dolphins. In March 1987 the rangers at Monkey Mia ceased purchasing the fish from Perth, but rather were supplied by local Shark Bay fishermen. This ensured the dolphins were being fed fish that they normally may have encountered in their natural habitat.

No accurate records were maintained as to the quantity of fish that was being fed to the dolphins and no policy existed to provide direction in this matter. However, the rangers recognised that the amounts of food being sold had increased with demand to the point where up to 35 kg of fish were being used each day. Furthermore, discussions between the rangers and Richard Connor of the University of Michigan, who has been involved in studying the Monkey Mia dolphins since 1982, indicated that abnormal behavioural changes during mating were occurring which were directly associated with feeding. As a result in September 1987 the amount of food sold daily was cut down to 21-28kg. In June 1988 the amount was further cut back to a maximum of 15kg per day. These amounts do not take into account the unknown number of fish fed to the dolphins by the rapidly increasing number of amateur fishermen. In February 1989 the sale of fish was ceased, allowing the rangers more control over the

feeding. Fish were still handed to the public to give the dolphins and the amount remained at approximately 15kg per day.

It is extremely difficult to assess if these past decreases in food sold for dolphin consumption had any effect on the visitation of the dolphins. Visitation is affected by a great variety of factors, and we would hope that it is not too closely correlated with available food at the Monkey Mia beach. Records maintained since early 1987 tend to show that the number of days per month the individual dolphins visit the area has remained fairly constant, the duration of these visits has been highly variable and shows no obvious correlation with the amounts of fish sold by the Dolphin Information Centre.

The sudden disappearance of seven of the regular Monkey Mia dolphins in January 1989 caused great concern as to the impact of increasing human presence at Monkey Mia. A report by Dr C. Simpson identified a possible problem with sewage in the fragile bay environment and action was immediately taken on this. However, it became clear that a total review of the operation was necessary in order to set guidelines that best protected the welfare of the wild dolphins at Monkey Mia, as well as preserve the unique and very special interaction between these animals and the visiting humans. A strategy for the feeding of these mammals is central to this endeavour.

2.2 Why have a feeding strategy?

The feeding of the Monkey Mia dolphins is clearly a contentious issue. There are pressures placed on the rangers to increase the number of fish available for the public to feed to dolphins, as well as to increase the frequency of feeding sessions, or at least time them to coincide with the arrival of visitors or coaches. Conversely, there are those who believe the amount of food should be restricted or even removed so as not to make it a central aspect of the interaction action between people and dolphins.

The changes that have occurred in the feeding of the Monkey Mia dolphins have been due directly to the demands of people, or more recently to a feeling by the rangers and the others involved that some sort of control is necessary. However none of the changes have had any biological basis.

So, the question must be addressed as to why it is not possible to simply allow the dolphins to determine their own food intake and offer them as much as they want, i.e. have no controls on the feeding at all.

There are several reasons that this approach is problematical. Firstly, it is likely, or at least possible, that some dolphins will become totally reliant on the food supplied at Monkey Mia beach. This "taming" of the wild dolphins means that the animals are dependant on the rangers to supply the correct nutritional regime for their physiological state. In other words the rangers must be able to recognise the changing needs of the dolphins that vary with environmental conditions, age, reproductive status, health status, and many other parameters. In a marine park it is possible to determine many of the parameters and even to influence some of the variables, however, at Monkey Mia such information is often unattainable. Consequently, it is not possible to predict the nutritional needs of any "dependant" animals with any degree of certainty. Such a situation would undoubtedly lead to major problems.

If the Monkey Mia dolphins received most or all of their food via public feeding then such things as vitamin supplementation would have to be initiated to compensate for the freezing process. Furthermore, the feeding of fish that have had parasites destroyed in the freezing procedure would also lead to changes in the parasite burden of the animals which in turn would affect their immunity. Such changes would be impossible to quantify and even more difficult to ameliorate.

From a biological viewpoint the overfeeding of dolphins at Monkey Mia beach would undoubtedly provide them with a selective advantage over the many dolphins that make up the population in the vicinity. There are many examples of major, undesirable changes occurring in animal populations that have become dependant on humans for nutrition. It is quite probable that our interference would also cause some undesirable changes in the Shark Bay dolphin population.

Perhaps the most cogent argument for not overfeeding the Monkey Mia dolphins is that the resultant dependence on hand-fed food would "tame" the wild dolphins of Monkey Mia and hence destroy much of the great value and appeal of interacting with and researching these animals.

On the other hand it is naive to believe that food is not an important reason for the dolphins coming to Monkey Mia. As such, to stop feeding the dolphins altogether risks ending the very thing we all wish to carefully preserve. A feeding strategy is therefore necessary to ensure the dolphins continue to visit the beach. This strategy must not only predict an amount to feed the dolphins but must also describe the optimum fish handling techniques, and deal with the best way to deliver this fish to the dolphins to ensure minimal risk of disease transfer and maximise the human-dolphin interaction.

2.3 The current dolphin feeding procedures

The current dolphin feeding procedure is supervised on the beach by the rangers of the Dolphin Information Centre. Each morning one 15kg box of fish is put aside and small amounts of this food are taken out during the day and thawed in a bucket for feeding. The feeding times are kept reasonably random, however most feeding tends to occur in the mornings.

When one or more of the four dolphins who currently hand feed swim in to the beach a ranger will immediately move to the water's edge to supervise the public interaction with the dolphins. At some stage during this interaction a second ranger will bring a bucket containing some fish down to the beach. All the people in the water will be asked to move out and form a line along the shore. The fish from the bucket will then be handed out to various people along the line and an explanation of how to feed the animals is given. The people with the fish then move into the water and feed the dolphin(s) as it moves up and down the line. The people are asked not to touch the dolphins during the feeding session. At the end of the feeding the people move back into knee deep water and continue to interact with the animal(s) until they swim away. A dolphin will not always be fed when it comes into the beach.

The rangers supervising the feed will attempt to make sure that the fish is equally distributed amongst the visiting dolphins.

2.4 A recommended feeding strategy

2.4.1 Fish preparation and food type

The current system of only feeding fish that are normally found in the Shark Bay region should be continued. It is essential that these fish are of excellent quality. The rangers should discard any fish they consider questionable and should carefully inspect all fish that is fed from the centre. Frozen fish that has been held in storage for longer than 3 months should not be used.

As wide a variety of local fish species and fish sizes should be used. The most appropriate fish types used to date have been;

Yellowtail Trumpeter (Amniataba caudovittatus)

Bony Herring (Nematalosa erebi)

Tarwhine Bream (Rhabdosargus sarba)

Sea Mullet (Mugil cephalus)

Tailor (Pomatomus saltatrix)

Whiting (Sillago spp)

It may be wise to restrict the species list to the above so as to avoid the possibility of presenting a toxic or otherwise inappropriate fish that a dolphin would not consume under normal circumstances. If, for some reason, no adequate fish is available in the Shark Bay region then Atlantis Marine Park could be contacted to assist in supplying high quality fish over a short period of time.

All fish must be thoroughly thawed prior to feeding to the dolphins. Between feeding sessions thawed fish should be kept in cool water under refrigeration. Any fish not used at the end of a day should be discarded.

The freezing process destroys significant amounts of fat soluble vitamins. However, as the food fed from Monkey Mia should only constitute a minor portion of any individual dolphin's diet then there is no need to supplement vitamins.

A more important effect of freezing is that it dehydrates the fish. As dolphins rely on the metabolic water of their prey to satisfy all of their

water requirements then great care has to be taken to minimise this effect. Presently the food fish at Monkey Mia is thawed in the local bore water. I recommend that only human drinking quality water is used, and certainly not salt water. Sharon indicated it would be possible to use rain water, which would be ideal.

The plastic buckets that are currently used should be replaced with stainless steel buckets. Plastic buckets are impossible to clean effectively and can easily harbour pathogenic bacteria. Presently there are no antibacterial agents used to clean the buckets. I would recommend the use of Betadine Surgical Scrub as the most effective agent. Buckets should be cleaned after each use and then cleaned again thoroughly at the end of the day. The fish preparation area should also be cleaned daily and should be used only for fish preparation. This sink is currently the only one in the Dolphin Information Centre and is used as a general purpose area by the staff. Additional facilities should therefore be provided. Furthermore, the sink area for the fish preparation should have a double sink area with adequate drainage on each side.

2.4.2 Dolphin feeding routine

The routine currently used (see above) works well. It is important that the feeding times continue to be random, and the type and amount of fish fed should also be random. The dolphins can easily discriminate when fish feeding will commence as the people move out of the water immediately beforehand. During feeding no handling occurs, this should help reduce any chance of the dolphins biting people as they are aware of when feeding starts and ceases. The technique of having the public lined up along the beach, with the fish handed out at random points along the line, maximises the view of the dolphin feeding for most people.

To further improve this feeding system I recommend that a maximum of 6 fish be handed out to the public at one time (currently up to 12 or more may be handed out). This ensures that the ranger in charge can properly supervise the feeding, as well as making accurate note of each dolphin's food intake (see below). During a single feeding session when more than 6 fish are to be fed the ranger simply hands the fish out in small lots until they are all gone. This will also have the effect of extending the length of the session.

The current average of three or more feeding sessions per day is appropriate.

There is an argument that in order to reduce the chance of disease transmission from humans to dolphins that only the rangers should handle the fish and feed the dolphins. However, I believe that as sick people are already requested not to participate in feeding and the number of people involved is small then the chances of disease transmission are acceptably small. Feeding the dolphins is enormously popular with the public and the rangers are keen that the dolphins do not become fixed on them as the source of food. This aspect of feeding may have to be reviewed in the future.

2.4.3 Dolphin food intakes

In order to determine a satisfactory food intake for any animal it is first necessary to estimate its total body weight and hence its daily nutritional requirements.

The Monkey Mia dolphins are Tursiops truncatus. This species occurs worldwide, however considerable variation in body size parameters have been recorded. One determinant of body size of a local population of Tursiops truncatus is believed to be water temperature, which has an inverse relationship with adult body size. It is not surprising, therefore, that the Monkey Mia dolphins, who live in the warm waters of Shark Bay, are smaller than, for example, the dolphins found in the relatively cooler waters around Perth.

Naturally we cannot handle the Monkey Mia dolphins to obtain an accurate body weight so it is necessary to extrapolate from estimated body lengths. I estimate that the adult female dolphins currently feeding at Monkey Mia are 2.1 -2.2 metres long (cf. 2.4 metres for the Atlantis dolphins). This would mean their weight range is approximately 110-120kg.

Daily nutritional requirements are also inversely affected by water temperature, ie dolphins in colder waters require more food per day to maintain a stable body temperature than dolphins in warmer waters. For the warm Shark

Bay waters the dolphins would require approximately 4.5 - 5.0 % of their body weight in food per day. For an adult Monkey Mia dolphin the weight of food required per day is therefore approximately 5 - 6 kg. Naturally this estimate can only be used as indicator of food requirements, as it will vary with the calorific value of the fish (which varies between species and between seasons), and the physiological state of the dolphins (a pregnant or lactating dolphin will require much higher food intakes).

Although no records have been maintained on food intakes of the Monkey Mia dolphins the rangers estimate that they have been feeding the animals approximately 2 kg of fish each per day for the past few months. This amount represents approximately 33% of a total adult food intake, an amount that I believe should represent a maximum for a daily feed. This means that each animal is still required to forage for two thirds of its nutritional needs and should therefore not become overly dependant on hand feeding.

If, as I recommend, the maximum food intake for any dolphin should constitute up to 33% of its daily needs, it seems that there is little risk of disturbing the situation that already exists. In essence we are not changing the food intake from that of the past few months. However it will be necessary to review the amount regularly to ensure that it does not cause major changes in the frequency of visitation.

The 2kg, or 33%, of the adult dolphin intake will naturally vary with lactation and many other physiological events. I do not believe that the amount of food fed from the beach should vary to accommodate these additional needs. We cannot adequately predict the additional requirements of the animals, and it is important that they be capable of increasing their time spent foraging in response to their own energetic needs.

Because the feeding of dolphins is random, and fish are handed out to the public for feeding, there is no straight forward means for the rangers to accurately record each animal's daily food intake. I believe the best way to facilitate this would be for them to use a daily record sheet such as the one appended to this report. The rangers can count the number and species of fish fed to each dolphin in each feeding session. They can then record this on the sheet and estimate the weight of this feed by weighing the same number of the same species of fish (assuming there is little variation in the sizes of fish

from one frozen block) or by directly weighing the total feed prior to feeding the animals. At the end of the day each animals approximate food intake can be tallied up. At the end of each month a summary sheet such as those appended to this report can be completed. These summary sheets should be able to identify any early trends or problems. It would be most useful to record daily water temperature on the daily food intake sheets to view any relationships that may emerge.

The rangers already maintain records of beach attendance of each of the dolphins. These records should continue and each month be compared to actual food intakes.

2.4.4 Feeding of the dolphins from boats

If the above recommendations are to be followed then it is essential to have control over all fish fed to the dolphins. Currently an unknown, and seemingly substantial, amount of fish is fed to the dolphins from fishing boats in the area. I recognise the traditional aspects of this practice and how in many ways it may be considered desirable. However, the enormous popularity of Monkey Mia has meant that it is now a very different place to the quiet and unregulated Monkey Mia of the past. Our only hope of maintaining the integrity of the place is to ensure that the welfare of the dolphins is paramount. As such I believe there is no option but to request that the only feeding of the dolphins be done on Monkey Mia beach under the direction of the Rangers.

I believe that a carefully worded information sign at the Monkey Mia boat ramp requesting that the fisherman not feed the dolphins and explaining the reasons would be most effective. Furthermore, the section in the current information brochure stating it is acceptable to feed the dolphins with fish caught by fishermen should be deleted.

3 Boating regulations

Some concern was expressed during my visit as to the enormous increase in boating activity in the Monkey Mia region and I was asked to comment on it. I viewed a document prepared by Ron Shepherd which covered

aspects on boating such as hydrocarbon spills and concur with his recommendations.

The major areas that seem to cause problems are boats travelling at excessive speeds close to the dolphins and the feeding area, and the use of some inappropriate vessels such as jet-skis. Following discussions with Ron Shepherd and Sharon Gosper we recommend the following;

- a) The boating speed limits be set as per the attached sketch.
- b) The dolphin feeding area be extended slightly to abut the jetty, to extend to a line parallel to the end of the jetty, and to include 100 metres of beach.
- c) Skiing be prohibited in the area.
- d) Wind powered vessels such as windsurfers abide to the same speed limits as powered vessels, as per the attached sketch.

4 Dogs

Sharon Gosper expressed concern as to the possible impact that dogs may have on the dolphins. She related on incident when a dog bit the dorsal fin of a dolphin and many incidents when dogs have barked at, and scared, dolphins. As there also exists some possible threat of disease transmission (if small) between dogs and dolphins I believe it would be wise to totally ban dogs from the Monkey Mia beach.

5 Hovercraft

During my visit to Monkey Mia I had the opportunity to view the operations of the Hovercraft that travels daily from Carnarvon to Monkey Mia. A flight was organised by Ron Shepherd, on board were Paul Anderson (Dugong researcher), Ray Masini (EPA), Ron Shepherd (CALM), one Denham resident and myself. After having viewed the hovercraft from the air and from Monkey Mia beach I believe that there is minimal, if any impact on the marine mammals in the area.

Ray Masini and I attempted to listen to the hovercraft as it arrived at Monkey Mia using a sensitive hydrophone placed in the area the dolphins feed. We were unable to detect any sound in this area. This relatively crude test at least indicated no major transmission of sound audible to humans under water. As the hovercraft leaves a small wake as it travels over the water it seems

highly likely that both dugongs and dolphins would be capable of detecting the approach of the vessel and avoiding it.

Several dolphins were actually feeding at the beach when the hovercraft arrived and showed no evidence of disturbance.

DOLPHIN DAILY FOOD INTAKE SHEET

DATE:

Dolphin	Time	No. and species of fish	Estimated weight	Total daily food intake	Comments

YEAR:

DOLPHIN MONTHLY FOOD INTAKES

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Mean monthly intake
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Mean annual intake: _____

