# The Other Colonists: An Informed Look at the Dolphins of Pern (part 1)

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Dolphins have long had a treasured place in human culture. Throughout history many races, including the Greeks and Aborigines have revered and even worshipped them. The Greeks cited them as having special powers and unusual intelligence and they were considered a sailors' ally, many tales being told of them rescuing shipwrecked people. The Greek legend of Arion, musician and poet, tells how he was set upon by the crew of his ship and, as a last request, was allowed to play his lyre. The music attracted a pod of dolphins and, jumping overboard, Arion was rescued by them.

Descriptions by Aristotle suggest that the Greeks knew that cetaceans were not fish. In fact dolphins, part of the sub-order *Odontoceti* (the toothed whales) in the order *Cetacea,* are mammals: they are warm-blooded, breathe air with lungs and give birth to live young which the mother suckles on milk secreted by her mammary glands(1). They are secondarily adapted from the terrestrial to the marine habitat and are believed to have evolved from small furry four-legged animals called creodonts (1). This essay is intended as a general introduction to dolphins and the Dolphincraft of Pern and will cover morphology, ecology and behavior of dolphins, specifically that of the dolphin species found on Pern. The second part of the essay covers dolphin traditions and behavior on Pern, including details of the ancient and modern Dolphincraft.

**General Morphology**

Cetaceans are unique among marine mammals in having a totally marine existence and consequently display many morphological adaptations to the pelagic (open water) environment. The most obvious of these is the modification of their lirnbs. The bones of the forelimbs have shortened and flattened and the pentadactyl 'hand' extended, the 'fingers' being contained within a common integument, forming paddle shaped flippers'. These are used for steering and stability and in social interactions. The hindlimbs have been lost completely, with traces of their previous existence being present within the body, while the blowhole has migrated to the top of the head where it allows exchange of air whilst the animal is moving. The blowhole is normally closed by a nasal plug and requires muscular action to open it. This prevents water from accidentally entering the blowhole.

Certain morphological features appear to be a direct consequence of water resistance and the need to overcome frictional drag. External protrusions such as ear pinnae and reproductive organs have been eliminated to allow smooth passage through the water. The reproductive organs in particular are hidden in furrows and openings so as to provide no external resistance. The absence of a neck region, and the blubber layer beneath the epidermis, eliminate any irregularities in shape. Finally, the lack of hair follicles and cutaneous glands -- excluding the head region where 'sinus' hairs act as functional sense organs -- provide a smooth surface reducing drag still further(2). Swimming speed is also improved by the properties of blubber. This consists of a layer of fatty tissue, the hypodermis, beneath the skin and is loosely attached to the skin musculature. This structure allows the outer skin to be deformed by changes in pressure, causing ridges that eliminate turbulence and reduce drag(2). In addition, the skin secrets droplets of ethlyene oxide from the epidermis into the water flow which are thought to maintain a laminar flow, reducing turbulence and drag by dissipating the energy of the impeding vortices(3) .

A dolphin's main propulsion comes from its tail flukes. These are a secondary adaptation and are attached to the body by a narrow neck. Unlike fish, movement of the tail occurs in the vertical plane. The flukes consist of tough, dense fibrous connective tissue, attached to the tail vertebrae and surrounded by a ligamentous envelope extending from the tail stock(2). They contain two large dorsal muscle blocks and two smaller ventral ones. Most movement comes from the upstroke when the dorsal muscle blocks contract. This structure gives the cetaceans great power and mobility which can be seen in the spectacular breaches and leaps so often performed by species such as Tursiops truncatus, the bottlenose dolphin.

The bottlenose dolphin and others such as the striped dolphin can achieve high swimming speeds by leaping from the water in a series of arcs every time they need to breathe, instead of swimming along at the surface. Called 'porpoising', it enables them to reach speeds of up to 40kmth (25mph)(4). Such speed and maneuverability is obviously of great benefit for feeding and migratory purposes and is important in social interactions such as mating where careful positioning is important! The dorsal fin of the dolphin, which the Dolphineers of Pern hold to be propelled around by their partners, is not made of bone but of a fibrous and fatty material which is thought to function somewhat like a keel of a ship(1).

Living constantly in water is a problem for warm-blooded animals in that water is a far greater heat exchanger than air. Heat retention and, conversely, overheating, are two problems that have to be overcome. Cetaceans have mastered heat loss to a large extent with the layer of blubber. Within that layer is a network of thin-walled capillaries termed the counter-current exchange system. This results in heat lost from outflowing blood being largely recovered by closely adjacent inflowing blood(1). The necessity of temperature regulation is responsible for noticeable differences in size within a species; bottlenose dolphins living in colder Northern waters are larger as bigger bodies lose heat more slowly, having a smaller surface area : volume ratio.

Cetaceans spend much of their time underwater but must surface occasionally to breathe. That they do this rarely indicates some adaptations to oxygen stress and the affects of pressure. Dolphins show apnoea, which is where the normal respiratory rhythm is interrupted by lengthy periods when no breath is taken(2). That they can do this and still manage to exchange enough oxygen and carbon dioxide is attributed to their more efficient ventilation: Cetaceans exchange up to 90% of the total lung capacity at each breath compared to our 10-15%(2). The blow that sometimes appears when dolphins breathe is not, as described in the Pern series, water but droplets of mucus that have collected at the junction of the larynx and the trachea(1). Reports of the fishy smell and slimy feel of a cetaceans blow suggest you wouldn't want to be anywhere near them at that point! Dolphins also have between 8-9 times higher concentration of myoglobin in their red muscles when compared to humans. Myoglobin, a molecule similar to the more familiar haemoglobin, has a high affinity for oxygen and stores it for use by the muscle enzymes. This, in conjunction with a greatly increased tolerance to lactic acid and CO2 accumulation in the blood, allows lengthy dives to be made(2).

Diving cetaceans must also contend with the effects of pressure. Under pressure, nitrogen dissolves in the blood and tissue fluids and, on surfacing, bubbles out causing disabilities and even death ("the bends"). Dolphins are unaffected because they do not breath under pressure. A cetacean dives with its lungs full of air breathed at atmospheric pressure. As it dives, the pressure causes the lungs to collapse and the walls of the alveoli to thicken, reducing the rate of all gaseous exchange(2). In addition, at depths of 100m+ the remaining air has been forced into the bronchi and trachea where no gas exchange can take place(2).

Dolphins appear not to have any sense of smell and a reduced sense of taste. Visual acuity varies between species; bottlenose dolphins have been shown to possess good vision both underwater and in the air. They may also be able to sense magnetic fields. Some animals, such as pigeons, use these to navigate and it is interesting to note that many of the strandings of live cetaceans occurred where the magnetic field lines were either altered, or intersected the coast(1).

The major sense used by cetaceans and particularly by dolphins, however, is sound. Dolphins use sound in two ways, for echolocation and for communication. When echolocating a dolphin produces intense pulses of sound (clicks) in the range 0.25 to 220kH(1). These bounce off objects in their path and from the echoes produced the animals is able to build up a highly detailed picture of its environment. Studies have shown that an echolocating dolphin can differentiate between two identical shapes differing only by a few mm in thickness(1). In addition, it appears that what a dolphin 'sees' through echolocation is functionally similar to what it sees through vision. Sounds produced for communication are complex and include various clicks, pops, buzzes, squeals and whistles. The method of production and reception is complicated but basically sound produced in the nasal passages is focused through the melon (the wax-filled lump in the forehead) and returning sound is received through the lower jaw(2).

**Pernese Species**

Now that we have established the basic morphology of dolphins, we can go on to look more closely at the species found on Pern. In Dragonsdawn, Anne McCaffrey established that two species of dolphin were transported to Pern, 'the blues and bottlenoses'(5). in total 25 animals. In later books the 'blues' appear to have been forgotten' though 'The Tillek' Theresa(6) may take her name from Teresa, the largest blue and 'speaker for dolphins'(7). There is no dolphin species called 'blue' here on Earth and the closest I have found is the Striped dolphin which is also occasionally known as the 'Blue-White Dolphin', among other things. The 'bottlenoses' are of course the Bottlenose dolphin, *Tursiops truncatus,* and both species are part of the family *Delphinidae.*

The striped dolphin (*Stenella coeruleoalba*) is an oceanic, offshore species that is only found close to land where the water is deep, examples being the underwater canyons of Monterey Bay, California and waters adjacent to the steep sided volcanic island of Tenerife. On Pern such places might include Nerat Deep. It is a tropical and subtropical species, but is also found in warm temperate waters(4.) An adult striped dolphin ranges from 1.8 - 2.5m (6-8'/4 ft) in length, generally smaller than the bottlenose dolphin, and has a more prominent beak. In appearance it has a bluish grey or brownish upper side with a pale grey finger shaped marking below the dorsal fin and pale grey sides. The belly is white or pink and the flippers are dark grey. Other important identification markings include a black patch around the eye and a thin dark streak behind the eye(4).

In contrast the bottlenose dolphin (*T. truncatus*) has both offshore and coastal populations which appear to.-differ somewhat in both size and behaviour, the coastal form being smaller and more social. The species is distributed

from cold temperate to tropical seas and will even enter the lower reaches of rivers, harbors and estuaries(4). An adult bottlenose ranges from 1.9 - 3.9m (6~/4 - 12374ft) and has a predominantly grey coloration with a white or light grey belly(4). This coloration varies slightly between populations and the adult males in particular are often heavily scarred.

**Food and Feeding Methods**

The two species have similar diets, feeding on fish and squid, with the striped dolphin also taking crustaceans such as shrimp. When feeding, the striped dolphin will dive to at least 200m deep4. Both species are opportunists whose diet varies greatly between regions and seasons and it is unlikely that the two are in direct competition for food. As well as pelagic (open water) prey the bottlenose dolphin will also take benthic (bottom-dwelling) fish, foraging alone as such prey are widely scattered.

Dolphins tend to feed on schooling prey which is distributed in a clumped manner. The best way to find those clumps is to search a wide area and this is probably the reason why feeding dolphins often travel in large pods which can scan acoustically a greater area than would otherwise be possible. Seabirds often make use of cetacean schools as a cue for finding food. Often dolphins pursue fish to the surface since it is easier to trap them at the air-sea interface and this further helps seabirds in their attempts to capture food(1). It is likely that various species of wherry on Pern will have cottoned on to this.

Dolphins use many different strategies to catch their prey once they have located it. In some cases the dolphins actively herd the fish shoal to the surface by swimming round it in an ever-tightening formation(1). The dolphins may also project loud sounds and trains of echo-clicks which further bunches the fish and had been observed to stun some which are then picked up at leisure. The herding appears to be co-operative and communication between individuals may occur by various whistles. Bottlenose dolphins have been observed using sloping sandy shores to trap their prey and, on the west coast of Africa, Mauritanian fishermen cooperate with bottlenose dolphins to capture mullet. The dolphins herd the fish into shallow water where the fishermen place gill nets among the fish, allowing the dolphins to feed at the same time(1). The fishermen signal the dolphins to feed by slapping the water with sticks. Such co-operation could probably be used on Pern, if that is, you can find a progressive forward-thinking fisherman!

**Life History**

Dolphins appear to give birth during periods of food abundance, the timing of which depends on the latitude in question. gestation for the bottlenose dolphin is 12-13 Terran months (about 13-14 Pernese months) with the calf suckling for about 19 Terran months(1). In the striped dolphin the gestation period is 12 Terran months with the calf suckling for usually only 14 Terran months, though periods as short as 8 months and as long as 20 have been observed(1). Male bottlenoses appear to become sexually mature at 9-11 years and females at approximately 12 years of age, though neither will have reached their full length. In Florida, bottlenose dolphin females calve from about 12-13 years of age up until their forties. Striped dolphins mature somewhat earlier at 9 years of age(1). In both species the mating system appears to be polygamous with adult males competing for some mating access to females(2). This is supported by the presence of sexual dimorphism, at least in bottlenose dolphins, where the male is significantly larger than the female(2).

The bond between the mother and calf is a very strong one in all dolphin species, the calf being dependant on its mother for an unusually long period, from 3-10 years. At birth the mother assists the calf, born tail first, to the surface to breathe(1). Sometimes aunts, usually nonpregnant females, assist by supporting the calf from underneath. They may also support the mother if necessary. The aunts closely follow the new pair after birth, helping to protect the calf and sometimes acting as baby-sitters while the mother is feeding(1). If the calf is orphaned an aunt may adopt it, even producing milk to suckle it(8). The calf suckles fat-rich milk from a nipple hidden in a pouch on the mothers belly', the milk being squirted into its mouth, presumably preventing spillage.

While it is still young, the calf generally keeps very close to the mother, positioning itself above the midline forward of the dorsal fin(1). It often presses a flipper against her side, which both reassures the calf and allows it to move with the mother without a great expenditure of energy(1). In the bottlenose dolphin the mother whistles continuously for several days after the birth which may provide an acoustic imprinting stimulus(1). Both mother and aunts also produce a distinct vocalization, termed 'thunk', which reprimands the calf should it stray too far from their side(9). This call ceases once the calf reaches an age where it is less dependant. Despite this protection, 20% of all calves die in their first year(11).

The bond between mother and calf is so strong that should the calf die, the mother may carry it around on her snout for days. I have observed a female bottlenose dolphin, 'Unity', carrying her dead calf in her mouth in Monterey Bay, California. She was 'escorted' by the other members of her pod, largely females but also including two adult males. The 'atmosphere' among the group was one of extreme distress and they clearly resented our presence there. One of the males, Cherokee, came up to the boat and exhaled noisily several times while swimming between us and Unity. The 'chuffs' were felt to be 'anger' and we stopped our attempts to record the behavior of the group.

**Behavior**

Dolphins, in particular the bottlenose, are famous for their complex social lives which reflect ours in many ways. They appear to be one of the few animals that 'play' for fun and games may often be seen between both young and adult individuals. Often they will perform aerial leaps and spins and bow-ride with what appears to be exuberant enjoyment. 'Breaching' is a familiar and spectacular part of cetacean behavior where the animals launch themselves into the air head-first and fall back with a splash. In dolphins, the breach may turn into somersaults or twists before re-entering the water(4). This behavior is something of a mystery to scientists. It may be a courtship display, a form of signaling, a way to herd fish or dislodge parasites, a threat, a show of strength or, as I and most people would prefer to believe, simply for fun. Several times, a porpoise and a dolphin have appeared to purposefully leap by the side of the boat at exactly right moment to soak me completely, seemingly enjoying the joke.

The striped dolphin in particular frequently breaches, sometimes as high as 7m (23ft) and is capable of fantastic acrobatics such as back somersaults, tail-spins, and upside down porpoising(4). However only some populations bow-ride and most rarely approach boats. The bottlenose dolphin is also highly active, body-surfing, breaching and, being more tolerant of humans, frequently bow-rides and wake-rides(4). Some dolphins have been observed playing with pieces of seaweed, pebbles and other objects. Often in games social and sexual behavior is practiced with much tactile contact by young animals. Such actions function not only in courtship but also to cement social bonds'.

Other types of behavior include 'flipper-slapping' where the dolphin rolls over at the surface to slap their flippers onto the water, 'spyhopping' where cetaceans poke their head above the water and appear to have a look around, and 'logging', in which cetaceans may be seen at the surface floating motionless, all members of a group facing the same direction(4). This is a form of resting and one of the fascinating things about dolphins is that, when sleeping, they shut down only one side of the brain at a time, presumably to keep alert for predators.

**Group living**

Animals live in groups for several reasons, it helps with food finding, with predator defense (Seawhers probably look on dolphins as tasty snacks!), brings individuals together for reproduction and spreads the cost of calf rearing(1). The size of the group varies within a species depending upon their habitat and present activity. Coastal species, such as the inshore form of the bottlenose dolphin, live in mainly small groups, rarely above ten individuals but the offshore form can number up to 500(1). Pelagic, offshore species like the striped dolphin can form feeding groups of 2-3000, though groups typically number between 10 and 500 individuals(4).

The social structure of these groups appears to be fairly fluid with individuals swapping groups frequently. Generally, however, there are a core group of individuals that remain in association with each other over extended periods(1). It appears that mothers and calves may remain together for many years and segregation by sex and age is common. Bottlenose dolphins have been observed to form the following combinations (in decreasing order of frequency): females with calves, sub-adult males. adult females, sub-adult females, and adult males(1). This social structure appears to be similar in the striped dolphin as well. There also appears to be a dominance hierarchy system with dominance displayed in the forms of jaw claps, biting, ramming or tailslaps against subordinates(1). Studies suggest that male dolphins are dominant to females and. while female dominance relationships are age ordered and fairly stable, males have a changeable dominance relationship(10). This side of a dolphin is one that is little publicized and is unpalatable to those who prefer the view of dolphins as friendly, playful, happy animals above darker emotions and behavior. Nevertheless, dolphins use aggression in a variety of circumstances ranging from uniting to attack and drive off a predator (sharks can be killed by being rammed in the stomach) to fighting for access to mates. Dolphins commonly rake one another with their teeth and the young males in particular often have extensive scarring(1). Lobtailing is one behavior that is believed to be a form of aggression and involves the forceful slapping of the tail flukes against the water while most of the animal lies just under the surface(4).

The groups, or pods, of dolphins appear to have home ranges which vary considerably in size between populations, probably related to the availability of prey. Such home ranges can become complex. The home range of a group of bottlenose dolphins in Sarasota Bay, Florida was approximately 75 sq. km(1). However, within this group, individuals had smaller home ranges that varied according to their age or sex. Related females with calves had the largest range (40 sq. km), followed by sub-adult males. Adult males, adult females without calves and sub-adult females had the smallest ranges, between 15-20 sq. km(1). It appeared that these sub-groups of dolphins had preferred core areas where they spent much of their time, the membership of the group remaining stable for several months(1). The sub-group shifted to different parts of their home range every few days. In contrast, in Southern Argentina, individual bottlenose dolphins often moved up to 300km before returning to the original location(1).

Generally in bottlenose dolphin populations, the age and sex of an individual affects its social associations and movements, with some associations lasting over considerable periods. In Florida, related females stay together with individuals acting as aunts to the new-born calves(11) When the calves reached about three years of age they would leave the maternal group and swim with their

peers until sexually mature, whereupon the females would return to the group to breed and raise their calves(11). The individuals in the groups also appeared to have a core community of friends with which they would socialize before returning to the main pod. The males left the group permanently once they reached about six years old. Often they would form a pairbond with another young male that would last for years(11). Such pairbonds appeared not to occur in offshore populations, nor in some coastal groups, namely the isolated Moray Firth population. In these cases, males tended to be loners, covering great distances, sometimes travelling 100km in only a few days. It is possible that they were looking for mates as genetic studies indicate that in Florida at least, most of the calves fathers came from a different social unit, perhaps preventing inbreeding(11).

Further studies, this time on the Shark Bay bottlenose dolphins, have begun to clarify the complex social relationships. At Shark Bay, Australia, the main group of dolphins was led by a matriarch, Holy Fin who was about 30 yrs old. Here researchers found the same sub-groups of females as had occurred in Florida, with calves being dependant on their mothers for longer, about 6 yrs(11). During this time, a calf must develop relationships with other dolphins outside of its sub-group. To do this the calf begins to spend time away from its mother from about a year old, locating her again by whistling(11). Though this is highly dangerous, it appears to be essential in social bonding. These social bonds are nurtured with physical contact between individuals(11)

The Shark Bay males also formed pairbonds, an aspect of dolphin life missing (so far) from the Pern books. Researchers found that pairs of males would engage in synchronous movements perhaps communicating their strength and unity to other coalitions or to females(11). These coalitions would chase and herd single adult females, sometimes for hours or weeks, as a prelude to courtship, reducing the female's access to other males. Females in Shark Bay were not however totally dominated by the males. They appeared to exercise choice as to which male they mated with and frequently had male friends with whom they spent time and sometimes mated with even when they could not possibly conceive(11). Such behavior has led people to suggest that dolphins might be the only other species aside from humans that has sex for fun!

The Shark Bay study also noted that frequently, when rival coalitions met, a fight would ensue involving biting, jawing and high pitched buzzes and squawks(11). However, each coalition had another pair with which it was reasonably friendly, often swimming synchronously with them in close physical contact. The reason for this appears to be that larger alliances can overpower smaller coalitions and steal females from them, which often results in high speed chases and violent fights(11). Relationships were not always rosy between members of an alliance. Sometimes, should one coalition have succeeded in herding a female and the rest of the alliance then suddenly appear, a fight would follow with each insisting rigorously on access to the female(11).

Fights could also happen between members of a coalition, particularly when meeting another coalition. Researchers explain this by noting that if A likes B and C, but C does not like B, A might decide to shun B if C is around(11). Such behavior is startlingly like our own. After such tiffs the males would appear to make up, using tactile contact to do so. Further disturbing behavior involved cases of 'bullying' where groups of males would suddenly turn on long term companions, emitting highly aggressive sounds. No reason has yet been found for such switches but in one case a dolphin was driven from his group and vanished from the bay(11). Cases where bottlenose dolphins 'gang up' on other species such as the smaller spotted dolphin, have also been noted and further emphasize that dolphins are not completely the gentle and friendly creatures portrayed in the popular press.

Perhaps the most distressing discovery is that bottlenose dolphins are capable of violently attacking and killing harbour porpoises for reasons as yet unknown. The frequency of the attacks is such that 63% of the harbour porpoises stranded around the Moray Firth, Scotland died as a result of multiple skeletal fractures and damaged internal organs inflicted by bottlenose dolphins(12). One possibility is that in the enclosed environment of the Firth the porpoise's echolocation interferes with that of the dolphin's resulting in their determining to remove the source of the jamming(11). Such an action certainly tarnishes the benign and gentle image of bottlenose dolphins!

One final aspect of group living involves 'lone' dolphins. These individuals, usually (but not always) males, sometimes seek out swimmers and small boats, often remaining in the same area for several years(4). In at least one case, that of Jojo and Dean Bernal, human and dolphin appear to build up a special partnership that may be the forerunner of Anne McCaffrey's Dolphineers. There has been much written on the remarkable effects 'friendly' dolphins have on people, particularly those suffering from depression and for an introduction to this and to Funghie, Percy, Jean Louis, Simo and Jojo, I'd suggest reading books by Horace Dobbs, among others. It is not known why these dolphins seek us out in this way. Some have suggested that they are 'dolphin ambassadors' or are isolated and shunned by their kind. They are usually young and may be exploring or seeking mates. Whatever the reason, it is one aspect of dolphin behaviour that we treasure and these individuals bring us closer to understanding their world.

**Communication and Intelligence**

Dolphins are very vocal animals, sound being one of the main mediums through which they explore and visualize their world. Many people believe that certain species have their own language and can point to many studies that appear to show that dolphins have a high degree of

intelligence. Certainly some studies conducted both in captivity and in the wild have discovered some surprising and fascinating aspects of cetacean communication and intelligence. The sheer volume of discoveries is beyond the scope of this essay and anyone interested in reading about the subject should locate papers by researchers like Louis Herman, John Lilly, R. Connor and D. Caldwell.

The vocal repertoire of dolphins is very varied, containing, amongst other sounds, rattles, clicks, whistles, squeaks, squawks and groans. These tend to be divided into pulsed sounds such as clicks and burst pulses (chirps, chuckles) and unpulsed sounds which include whistles(1). Unpulsed sounds seem to relate to increased excitement or distress(1). Pulsed click-sounds are used for echolocation and navigation but also have a social function pulsed yelps occur during courtship and buzzing click-trains are used in aggressive confrontations(1). One study determined that the sounds produced by bottlenose dolphins fell into the following broad categories: Navigation/hunting - clicks, Play-chase/agonistic encounters - squawk, Courtship/mating - yelp, Threat - buzz, Alarm/fright/distress - squeaks, cracks, pops(1). Pops were also used in Shark Bay, Western Australia as a threat vocalization which induced females to remain close to 'popping' males during consortships(13).

Recent research has also determined that some species of dolphin, including the bottlenose, have their own signature whistle used for the communication of individual position and group cohesion(1). There is evidence that dolphins imitate each other's signature whistle as a means of attracting their attention (a sort of delphinic version of 'Oi Bob, it's me Dave over here!'). Female calves appear to produce signature whistles that are very different from those of their mothers, whereas male calves produce whistles that are similar to their mothers(14). Researcher believe that this is because matrilineally related females associate together and so there is a pressure to produce distinct whistles (14).. Males, who tend to leave the group, do not face such difficulties. In some species, such as the spotted dolphin, all calves have whistles that are similar to their mothers and researchers can therefore tell who is related to who. Perhaps this is an example of inheriting a name, much like our surnames or, like Icelanders. the call gives information as to the calves parents?

Dolphins learn to mimic sound very rapidly and are able to relate a sound to a particular object (such as a ball or hoop), giving a unique vocal label to the object(1). In addition it appears that dolphins can eavesdrop on another s echolocation, performing match-to-sample tasks after listening to another dolphin inspect the sample object(15). Experiments have also succeeding in getting cetaceans to respond to human vocalizations and even repeat them spontaneously(1). Work by Louis Herman has further established that dolphins are capable of understanding simple two or three-word sentences(1). When we consider that languages of whistles rather than words do exist in human cultures, an example being that employed by the mountain shepherds on some of the Canary islands (16), the abilities of Anne McCaffrey's dolphins no longer seem that far-fetched.

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