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MY LITTLE LEVIATHANS
MINKES OF MULL

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AMAZING RAYS
GREAT SKATES
KINKY CHIMAERAS

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NELSON MANDELA
THE GREEN STRIPE IN OUR FLAG

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NATURE POETRY CONTEST

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DANCES WITH DOLPHINS

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NATURE POETRY CONTEST

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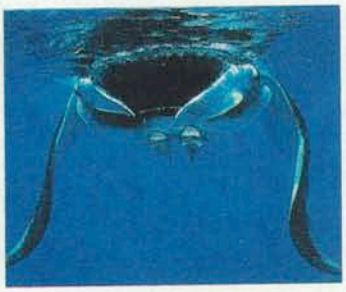
Spotted dolphins Stenella frontalis *striking a vertical pose that their friend and researcher Denise Herzing thinks is probably an orientation to humans. She's been in the pellucid Bahamian water with them off and on for six years now, and maybe ought to know. See 'Underwater overtures', page 688. Photo by* Bob Talbot. *Clownfish photo by* Michele Hall.



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REGULARS

EXTRAS

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Editor: Rosamund Kidman Cox
Art Editor: Simon Bishop
Production Editor: Wendy Smith
Assistant Editors: Cathy Wright and Dick Ellingham
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BBC WILDLIFE, Hyde Park House, 5 Manfred Road London SW15 2RS
Tel: 081 877 1080
Advertisement Director: Terry Lock
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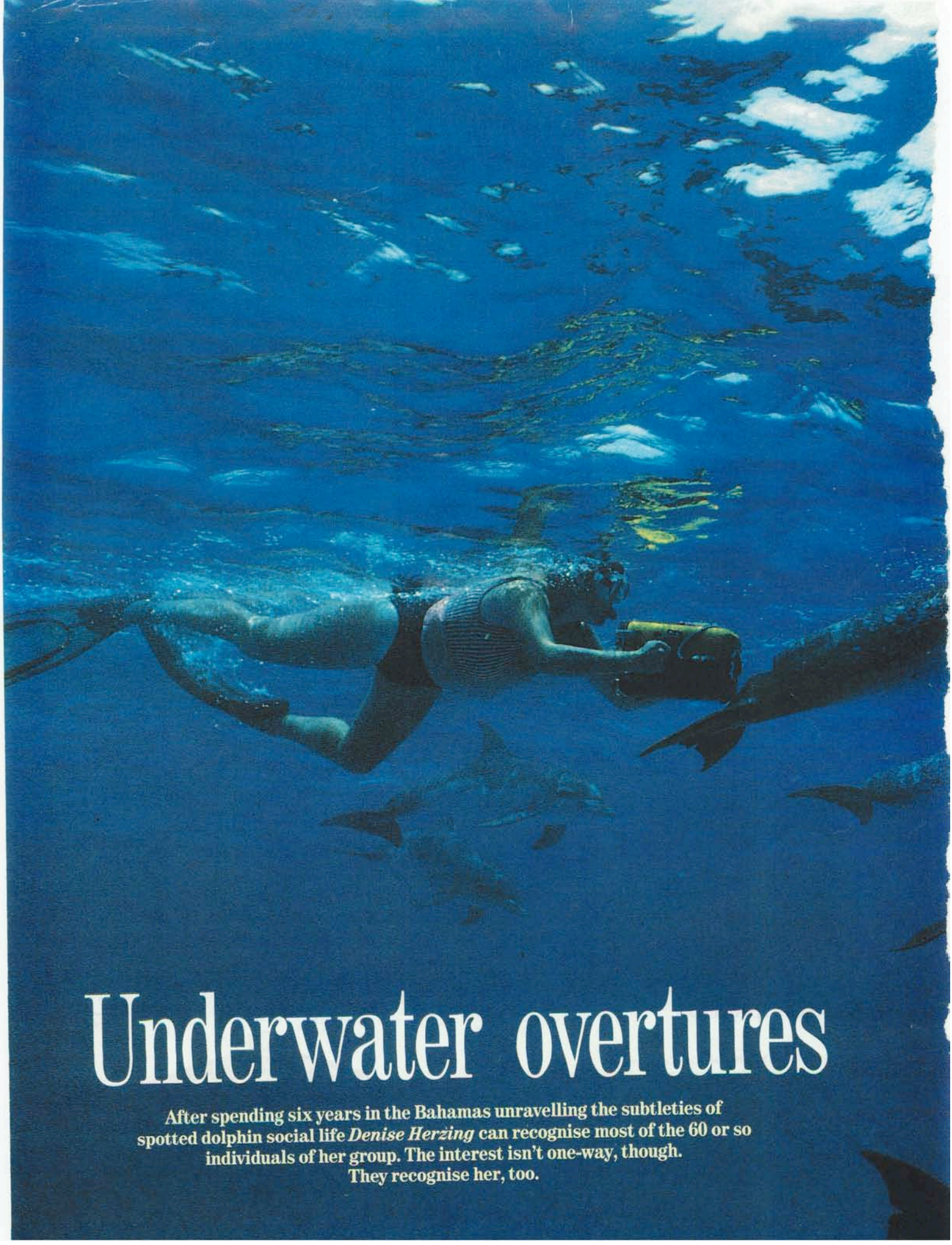
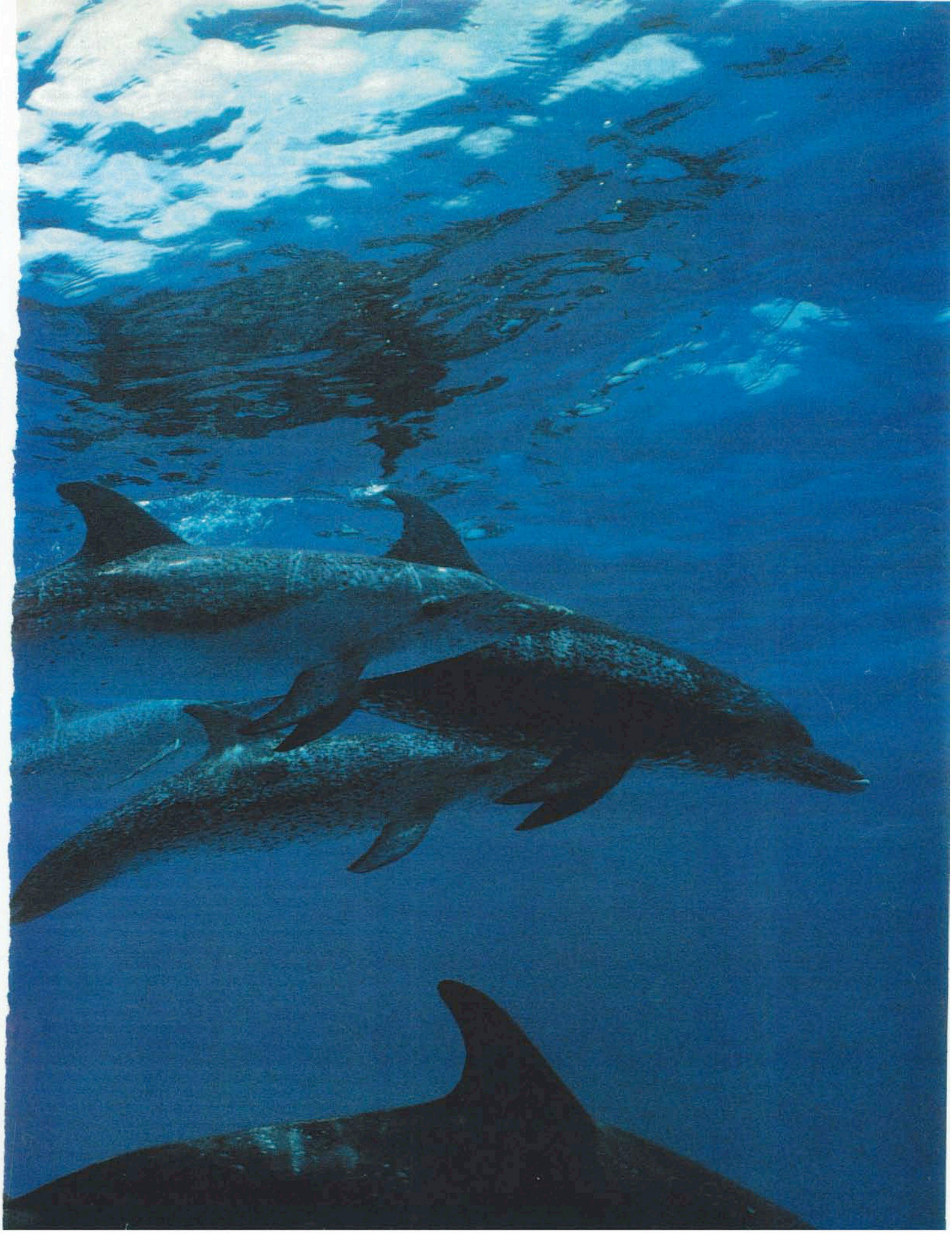


Underwater overtures

After spending six years in the Bahamas unravelling the subtleties of spotted dolphin social life *Denise Herzing* can recognise most of the 60 or so individuals of her group. The interest isn't one-way, though. They recognise her, too.

Underwater overtures



Opening spread: Doug

probably more gregarious than most. But she has also noticed that, over the years, dolphins in her study group have sought out humans more and more, particularly those who they recognise.

Opening spread: Drifting along at the surface is how the author, here equipped with a video camera, spends most of her research time. Among the rules under which she and her colleagues operate is one that forbids them from chasing the dolphins. "People have the idea that because they're free-ranging animals, nothing you do will bother them, but that's not true. Obviously they seek people out to a certain extent, but they also need to eat, and rest, and be safe from predators, and have time for their own thing."

Opposite: By mid-June, six weeks into the research season, the dolphins pay little attention to the author. When her team first arrives, though, they often behave quite differently. "It may be just that they've been without any people all winter, but they show a lot of excited behaviour in the first few weeks – they will swim really erratically and do their excitement vocalisation even more than usual."

short breaths break the surface. But below, the picture is quite different. Little Gash, a young adult female, zooms up behind me. As I direct the underwater video and sound gear her way, Knuckles, a young adult male, comes into view. He is pursuing her rapidly, his body arched and neck stretched, making an S-shaped posture typical of a courting male. He turns belly up, underneath but behind her, echolocating continuously on her genital area. Perhaps he is receiving acoustic as well as chemical information about her receptivity.

Little Gash darts here and there, but Knuckles is persistent. Eventually he parallels her every move, belly to belly, occasionally caressing her with his pectoral fins. Finally, after a few soft whistles, they mate. Little Gash is then approached by two other males who have been observing; they also mate with her. Surprisingly, the oldest male in the coalition, Stubby, does not pursue her. The mating system may appear promiscuous to us, but is it really – or do individuals have preferred partners over their years of acquaintance? Most likely there are many subtleties of their sexual and social lives we have yet to unravel.

Last year I observed Little Gash being pursued by a similar coalition of males; her reaction then was far from co-operative. She aggressively confronted one male, while the other two kept close to her pursuer. Swimming upside down, Little Gash repeatedly charged the male, Cat Scratches, who remained upright. At first glance it seemed a ballet, but to a trained eye it had a different meaning. The inverted posture, combined with an open mouth and butting of the body against the other, is an expression of aggression. The same ballet, performed by mature males, often escalates into a stationary face-off with additional signals, including an arched back, jaw-snapping and loud 'squawks' directed towards rival males.

Little Gash's behaviour escalated only to the extent of directing a few tail slaps at Cat Scratches' face. Eventually, it appeared her message – 'Not interested, but try another time' – was received. I had seen Little Gash perform this sequence years earlier, when she was a juvenile, but then it was in the context of play with her juvenile friends.

Observing dolphins is like observing icebergs. What you see on the surface is only a small percentage of what is underneath. That's one reason I chose the water, for extended periods of time. The shallow sandbanks are home to a resident school of Atlantic spotted dolphins *Stenella frontalis* (formerly known as *S. plagiodon*), a species which is relatively unstudied, unlike the pantropical spotted dolphin *S. attenuata* (though the tens of thousands of pantropicals killed in purse-seine tuna nets in the Eastern Tropical Pacific have provided biologists with a depressingly steady supply of carcasses).

The members of the Bahamas school of Atlantic spotteds have grown accustomed to humans in the water, giving me an incredible opportunity to observe them in their natural environment, and like elephant and primate researchers, to observe and record them foraging, mating and otherwise socialising.

It was in the summer of 1985 that I first began observing the spotted dolphins. Since then, I have spent five months of each year living at sea, documenting individuals, behaviours and vocalisations. The more I observe this group, the more I realise how limited we are by our terrestrial senses. For this reason I have employed high-tech equipment to decipher many of their signals. The use of underwater video with sound input has been invaluable in capturing moments that are too quick to note by eye. Dolphins move fast under water and their communication and behaviour is complex and rapid. In addition, some of their acoustics are above our hearing range. To capture and catalogue their vocalisations, I use a high-speed digital sound-processing board in my computer, which can produce sonagrams of different calls for comparison.

For a variety of reasons, we tend to think of dolphins as primarily acoustic communicators. First, sound travels very effectively under water – up to four and a half times as fast as it does in air. Second, dolphins utilise frequencies 10 times as high as we do, and have highly developed acoustic areas of the brain. But they also have excellent vision, taste and touch. Together with sound these create a rich repertoire of signals vital for the development and maintenance of the long-term bonds and associations characteristic of close-knit dolphin society.

Spotted dolphins live in groups for protection from predators and possibly to aid in co-operative foraging. Because of the apparent importance of their social bonds, I have chosen a framework for studying the Atlantic spotteds which incorporates not only the physical signals but also the social context in which they are used. This entails identifying individuals – by their spots, and marks on the dorsal fin and flukes – following relationships and association patterns over the years, and analysing their communication signals throughout their life history and within a social context – a 20-year project at a minimum.

What we know so far is that Atlantic spotteds live in groups of 50-60 animals. Most of an individual's time is spent in a smaller subgroup during the day, although it appears that these subgroups remain within acoustic range of each other for much of the time. During the day, the dolphins spend their time resting, socialising and foraging. Research on pantropical spotted dolphins shows that they are 'crepuscular' feeders, feeding mainly at dawn and dusk. And indeed, the Atlantic spotteds in my study area do move off the sandbanks in the late afternoon to feed on squid in deeper waters. But, like other behaviours, their foraging strategies are flexible, and they also hunt on the banks during the day for bottom-dwelling fish such as lizardfish, flounders, razorfish, garden eels and shoaling reef fish such as needlefish and ballyhoo.

Calves learn to forage when they are as young as six months. To help them, mothers, as well as older ▶

Denise Herzing

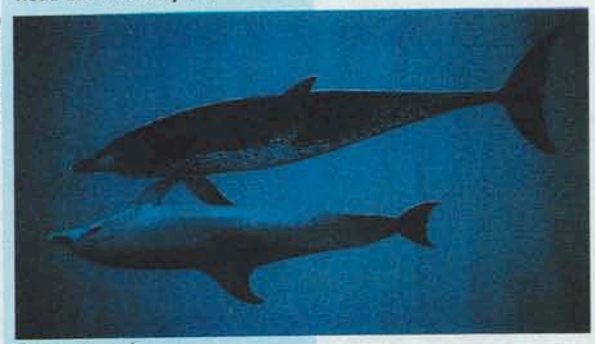
Below: Courtship can be a long and complicated process, involving much chasing and touching. Here Rosemole (above) and Punchy – both showing the 'mottled' spots of young adults – touch pectoral fins just prior to mating.

Dan Sammis

Open-mouth raking

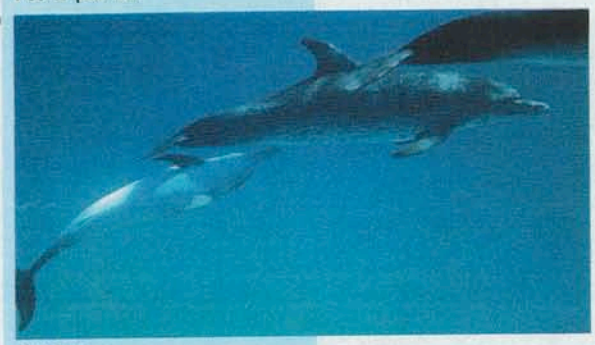
Denise Herzing

Head-butt and body rub



Denise Herzing

Pec-to-pec rub



Denise Herzing

Nursing

Denise Herzing

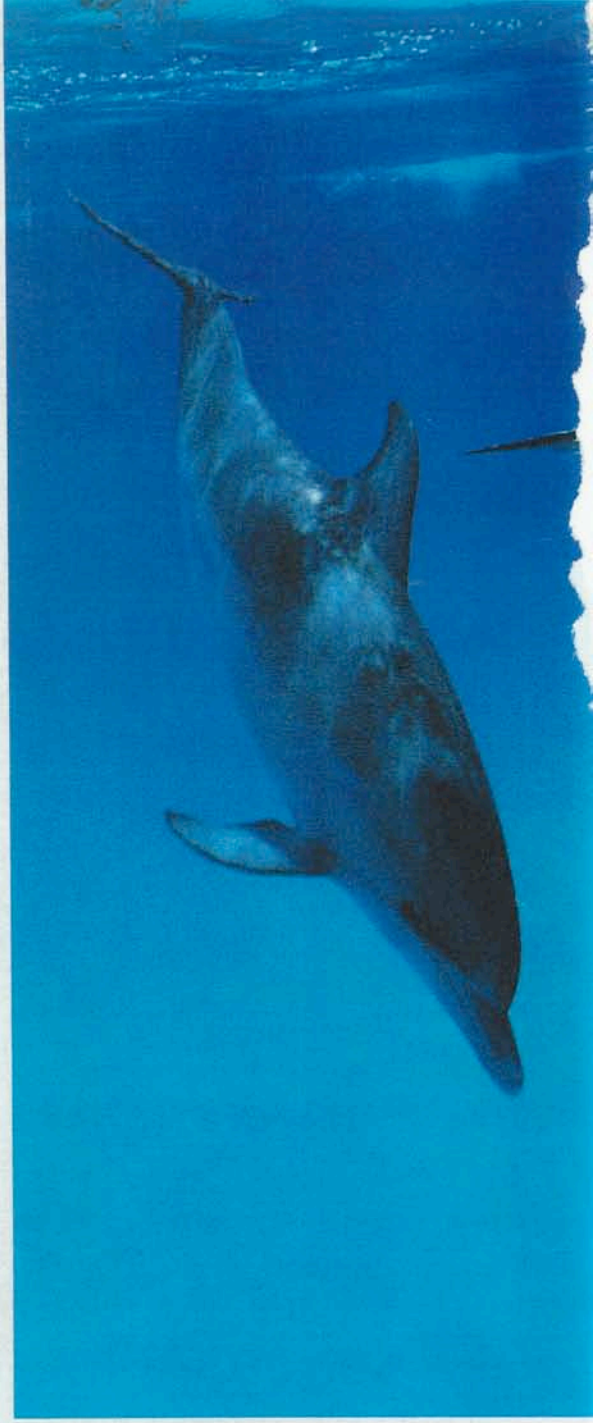
Foraging

juveniles, will often chase up a flounder for the young infant to catch. But during this time, the mother is still providing most of her infant's food. In fact, the calf suckles throughout its first three years. When her calf is very young, the mother will turn and present herself to it. Later, the calf will turn to suckle underneath its mother, signalling before it turns with only a few soft chirps.

When first born, spotted dolphins have no spots at all – they look just like small bottlenosed dolphins. This makes them convenient subjects to study, because their spotting increases with age through predictable stages. First there is the 'two-tone' stage, from about two weeks to three years (newborns of less than two weeks look much the same, but noticeably more awkward) followed by the juvenile or 'speckled' stage, from four to eight years; then the young adulthood or 'mottled' stage, marked by a rapid increase in spotting, from nine to fifteen years; and finally the mature adult, or 'fused' stage, at age fifteen and above, in which many of the spots are joined together.

Over the first three to five years, sometimes until well into the speckled stage, young spotted dolphins are tightly associated with their mothers. The mother/infant subgroup is one of the tightest units of dolphin society, and much revolves around it. Luna and Apollo are a mother/infant pair I've observed frequently over the past six years, since Apollo was born. By the time he was three years, he had developed a few dark spots on his side, which helped us identify him and record his behaviour as he learnt how to manage his sound-production and, by observation and interaction with Luna, how to forage on the bottom.

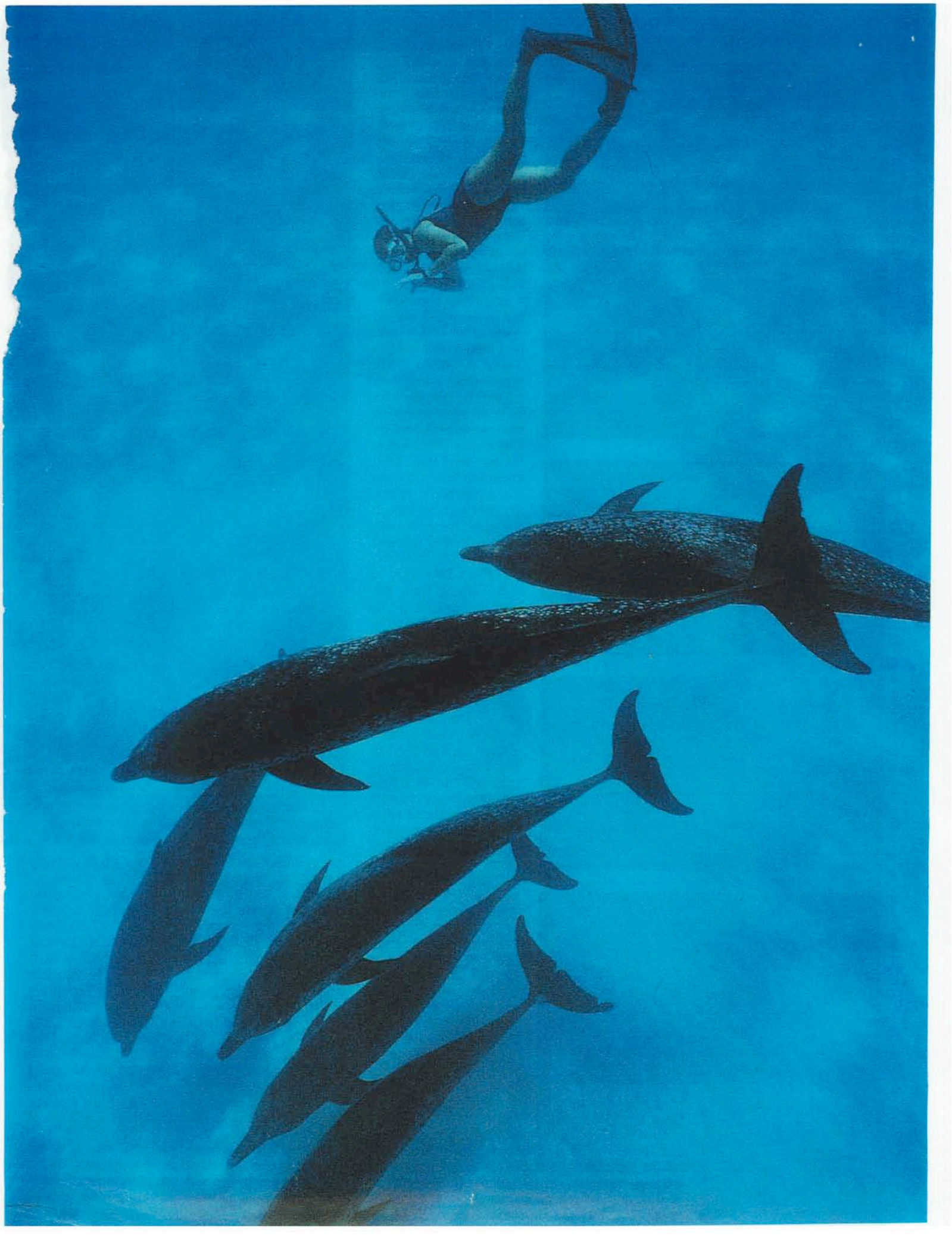
Luna may have had several offspring before Apollo and appears to be on a fairly consistent three-year calving cycle. Gestation takes almost a full year, and lactation two to three years, and so a three-year cycle is probably the absolute minimum for this population of dolphins. A female can conceive while still lactat-



energy during her reproductive years, which probably last until she is about 40. We still don't know what age individuals live to in this group, but pantropical spotteds have been known to live well into their forties.

In 1988, three years after Apollo was born, Luna had a female calf, Diamond, and this year she has had another male calf, Latitude. After the birth of each new offspring, the previous one begins to associate with other juveniles, though all a mother's offspring will still sometimes join her and the new sibling. In Luna's case, I noticed that another young adult, Little Gash, also spent a significant time with each of the new offspring. In 1985, when I began the study, Little Gash was already a fairly independent juvenile, and it had never been clear to me who her mother was. But after noticing her associations with Luna's recent offspring, I began to suspect that she, too, was one of Luna's calves.

Results from cataloguing dolphin sounds in the computer have lent weight to my suspicions. One of the few things known about dolphin vocalisations is that each individual has a unique signature whistle, the equivalent of a human name. A dolphin may use



probably did not survive the transition, possibly due to her failure to form bonds with others as an infant.

Though not entirely independent from the larger group, juvenile subgroups (comprising four- to eight-year-old 'speckleds') do spend time on their own foraging expeditions, with only an older juvenile present as babysitter, or an adult supervising from a distance. Many of the shark scars we observe are caused at this age. This may be due to juveniles spending increased time off the shallow sandbanks looking for food, or to them having less protection. It's easy to see how a predator might sneak up on a young dolphin. Juveniles, especially, can be stubborn and disobedient when out of range of immediate discipline. The first signal that a supervising adult uses to recontact the juveniles is its own signature whistle. If that fails, a tail slap is used, sometimes repeatedly, and often inverted to emphasise the urgency of regrouping. Finally, if they fail to heed any of these calls the adult will physically round up the juveniles.

Doug Perrine

When the members of a male subgroup are competing for dominance, they often swim in tight formation. Spotted dolphins have strict rules about when they touch each other, in this or any other situation. Says the author: "Until I understand those rules completely, I'm very careful not to touch them myself, leaving them to make the first move." That often consists of a dolphin rubbing against one of the researchers, "as if to test us out."

Association patterns change dramatically between the juvenile and the 'mottled' young adulthood phase (nine to fifteen years old). Females who conceive during adolescence are more likely to associate with other pregnant females than with previously close, non-pregnant associates. This may be out of energetic necessity, because pregnancy requires more foraging. This change became clear to me after watching three tightly associated females – Little Gash, Rosemole and Mugsy – reach sexual maturity at about 12 years old. Little Gash was the only one of the three not to get pregnant last year, but this year she has frequently been observed with male subgroups, actively engaged in courtship behaviour, and I suspect she will probably be pregnant by next year. Meanwhile Rosemole has successfully given birth to a female, Rosebud. At the end of last year's research season, Mugsy was also visibly pregnant, but she must have lost her calf through miscarriage or soon after birth, because when I first saw her during this year's field season, she was swimming with a nursery group of three mother/infant pairs, as if she had a phantom calf in tow.

Males, too, go through social changes during young adulthood. Strongly associated males keep their bonds, but seem to become more fluid in their association patterns. Aggressive conflicts within large groups of young adult males are routine, presumably a means of working out dominance and mating strategies. Such conflicts can escalate into serious aggression if not resolved quickly. Rapid chases, quick jaw snaps, tail slaps, and increasing rates of repetitive aggressive vocalisations all serve to get the message through. It is in these male subgroups that conflicts are worked out, and when females are present, the coalitions of males work co-operatively.

Working out who has fathered which calf is very difficult. Yet spotted dolphins must have strategies to avoid interbreeding. Hints of one possible strategy emerged in 1988, when a previously unknown group of dolphins appeared in the area resulting in a certain amount of emigration and immigration between the groups. And this summer, another group of spotteds has appeared, and all the adults have been heavily engaged in mating and courtship. Where these groups come from, and whether or not there are transient as well as resident groups of dolphins in this larger population, are questions for which we hope to have answers in the future.

The final transition to adulthood occurs at about 15 years of age, when an individual's spots have become fused. When compared with other intensively studied mammals, spotted dolphins seem to have no clear overall hierarchy, no alpha males or females. Age and experience seem to count more than gender when it comes to certain roles. Old males do often take on a defensive/protective role around newborns. But they also take a significant role, along with old females, in the care of the young calves. And it is not just young adult females, but males too, that take on babysitting tasks with juvenile subgroups.

Probably my greatest insights about dolphin behaviour have come from following individuals through the age classes and observing their changing roles in the society. But there are many inherent problems in documenting and deciphering signals under water. A starting point is to correlate basic types of behaviour and non-acoustic signals with the sounds recorded on my equipment. But it's not always easy even to identify the animal that a sound is coming from. (Unlike dolphins, humans have no ability to discriminate the direction of a sound source under water.) A signature whistle is often accompanied by the expulsion of air from the blowhole, and so if you happen to be facing that particular individual, you can be reasonably confident of the sound source. And when dolphins are young, and extremely excitable, they often lose control of their sound apparatus, creating an erratic vocalisation that is accompanied by rapid, excited swimming. Signature information is often contained within this sound, and can be readily correlated with the relevant individual.

Sometimes, though, a signature whistle may come, not from a nearby individual, but from a supervising mother or babysitter in the distance. In fact, this is a world where, because of the salinity, temperature and density of the water, individuals can stay in contact acoustically for miles. Spotted dolphins appear to use the shallow sandbanks for this purpose, in the manner of an underwater phone line. Individuals often descend the six metres or so to the white sand bottom, lie still and apparently make no sound at all; at other times, they will emit sounds on the bottom when no other dolphin is in sight.

The problem of studying visual and acoustic signals is compounded by the fact that one signal from an individual can have different functions depending on who else is interacting, what their relationship is, what their ages are, and what main events are under way. Only when I include all these relevant factors do I start to make sense of the spotted dolphins' rich but subtle communication.

The problem which will always remain is that, as a land mammal, I am totally out of my element and can only get a small glimpse of their lives under water. When the seas pick up and a squall moves in, the dolphins disappear. Where they go during large storms I have no idea – possibly to the leeward side of an island, though the nearest one is far away, and in any case, they are animals of the open ocean. I, though, am forced to return to the boat and wait out the storm, trapped on the surface again.

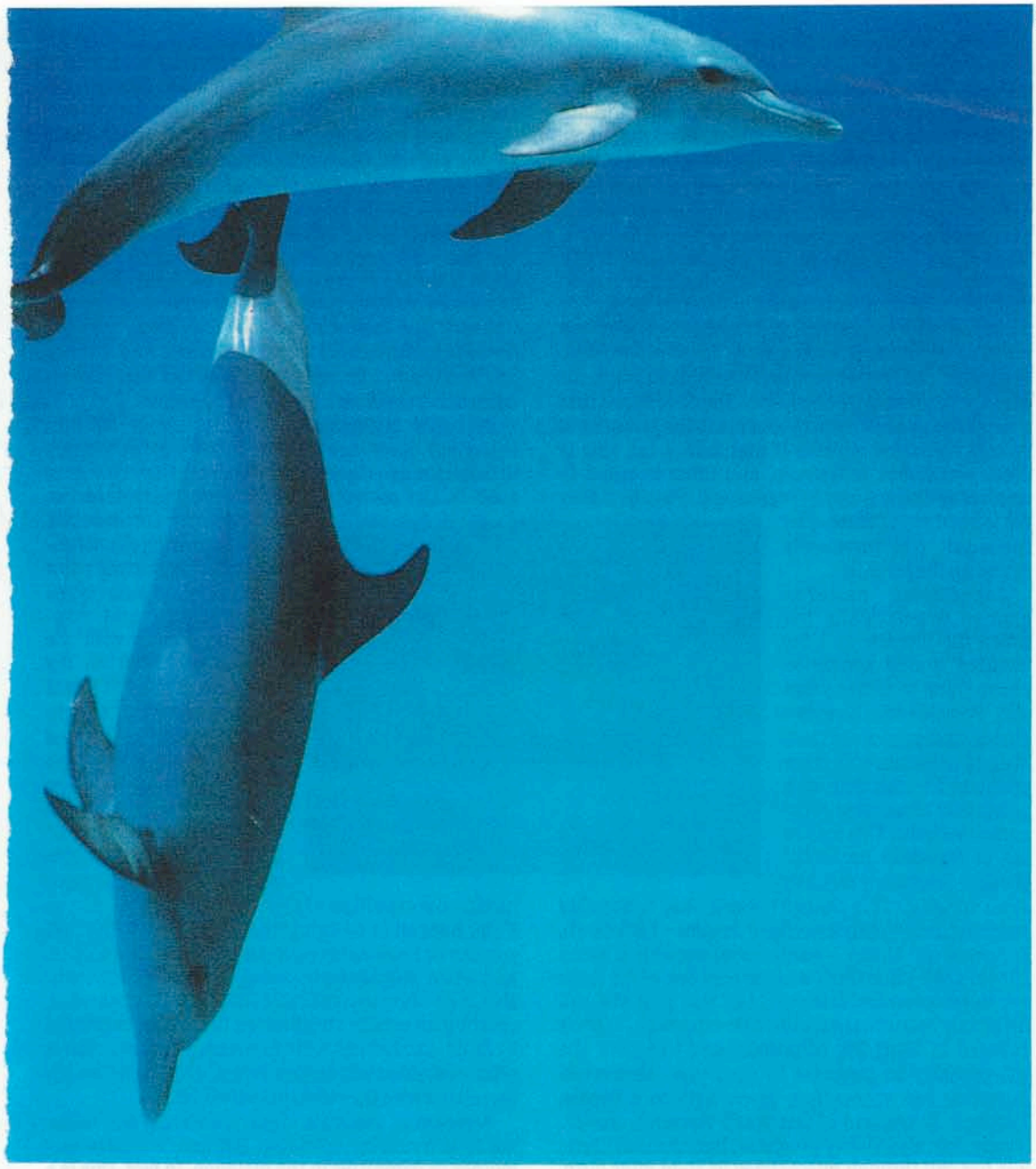
TV Link

These spotted dolphins will feature in the Caribbean programme of *Sea Trek*, to be shown on BBC1 on Monday 14 October at 8.30pm. This is the second of five dive sites to feature in the weekly series, which kicks off the previous Monday with the Galapagos Islands, and continues with the kelp forests of California, the Great Barrier Reef and the Hawaiian Islands.

Author

Denise Herzing has been working with free-ranging Atlantic spotted dolphins since 1985, and is currently research director of the Wild Dolphin Project, which sponsors this work. She graduated in 1979 with a degree in marine zoology and went on to study the migration habits of the grey whale. In 1983, her graduate work in behavioural biology took her to San Francisco to study bottle-nosed dolphin communication and behaviour.

The **Wild Dolphin Project** is a non-profit organisation supported by donations from individual members and by grants from corporations and foundations. Membership, from $25, includes a bi-annual newsletter and a chance to do



four and eight (the juvenile 'speckled' stage) in groups with others of the same age, learning and practising behaviours. The author believes that the unusual clarity of the water here – which enables her to study the dolphins so readily – probably enables them to use visual signals more than dolphins elsewhere.

Opposite, top to bottom:
'Open-mouth raking' is often used as an act of aggression.

The 'head-butt and body rub' is also used – usually between two males – to show aggression.

The 'pec-to-pec rub' is used by a mother and infant (in this case, Snowflake and her two-year-old daughter Snow) to make contact after they've been apart for a while.

Nursing often occurs while mother and calf are swimming along (this infant is about a year old, but he may be suckled until he is five.)

Spotted dolphins often dig for flounder in the sandbanks, though some foraging also takes place in deeper water.

with other individuals, and possibly to label a family unit. In fact, in some populations of bottle-nosed dolphins *Tursiops truncatus* it appears that a calf's signature whistle may be a derivative of its mother's. When I compared the signature whistles of Luna and Little Gash, they were almost identical.

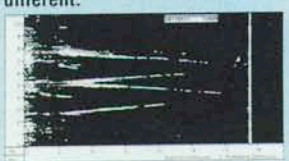
Apart from vocal signals, there are many other communication techniques that a calf has to learn. In the early years it will remain in physical contact with its mother for much of the time, and she may guide it with her body to indicate a change of direction. A brush of the pectoral fin is used when the pair reunite or when the infant is preparing to depart briefly. Visual cues can also be initiated by the mother at a distance; she may rotate her pectoral fin, for example, which means, 'Come over and get a pec rub'.

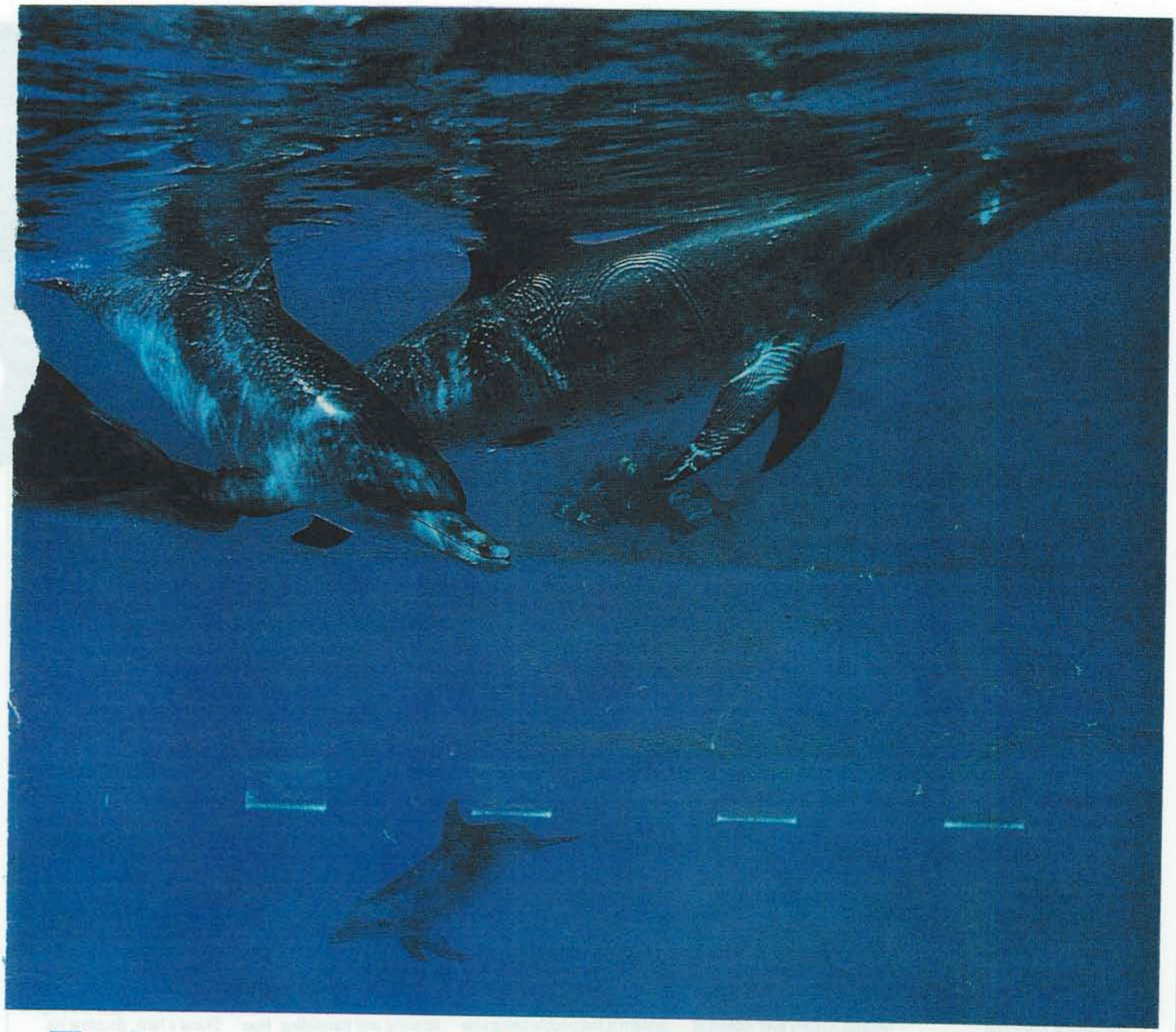
Infants also explore social signals in the context of play with other juveniles. Chases, head-to-head confrontations, raking of teeth against each others' bodies and slamming against each other are all explored in the form of friendly competition. These same signals, if used by older dolphins, carry specific information about aggression, courtship and affiliation. Just as they learn the socially appropriate time to use acoustic signals, youngsters have to test and learn appropriate uses of other social signals.

One of the quickest ways of doing this is through mimicry. The young dolphin has the advantage of being surrounded by juveniles of varying ages who act as demonstrators. The southern stingray is a preferred plaything. I recall watching Apollo learn the fine art of herding a stingray by mimicking the agility and moves of the older juveniles. He first tried a circle around the 'prey', but his movements were not quick or clear enough to be effective. The older juveniles then returned to demonstrate the correct manoeuvres.

A juvenile's success at this stage seems to depend on how well it has accepted independence from its mother, and how it has related to other youngsters while still with her. Apollo and then Diamond each mixed successfully with other juveniles of their own age when their mother, Luna, gave birth to another sibling. But Pictures, a female calf of Nippy's, did not fair so well. She stayed with Nippy a full five years, until Nippy had another calf, and tended to be very dependent on her mother during that time, never venturing off with other juveniles. Pictures has not been sighted since the birth of her sibling, and ▶

Sonagrams of signature whistles provide clues, not just to identity, but possibly also to maternal relatedness. Luna's (*below*) and her (suspected) daughter Little Gash's are almost identical, while that of the older male Stubby (*bottom*) is noticeably different.





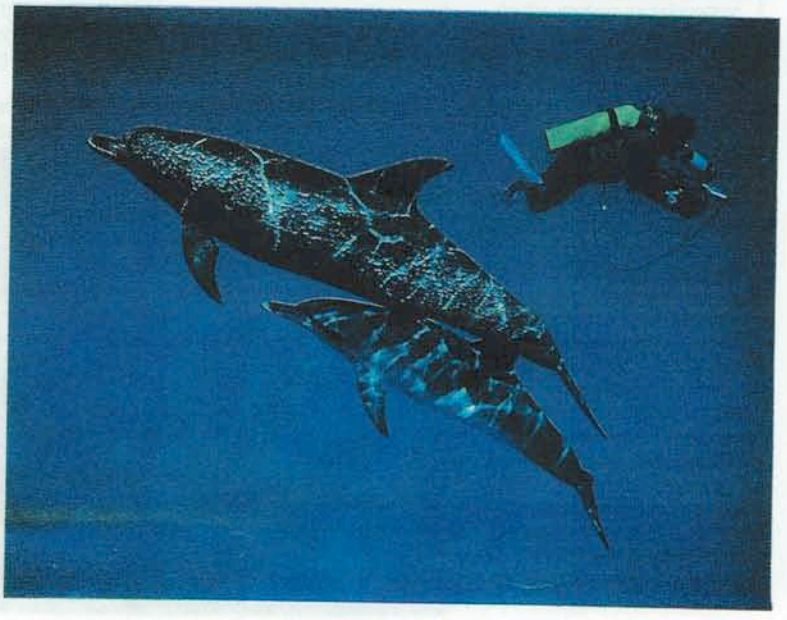
Photographs by Georgette Douwma (camera assistant)

The human study project

The fact that dolphins make whistles and clicks is something that was recognised by Aristotle, who suggested that they might be able to mimic humans — whereupon he set the tone for human/dolphin communication projects for the next 23 centuries.

Not that there were that many projects between Aristotle and the 1950s . . . but when interest in the subject was resumed then, the main thrust of it was to teach the animals, if not to *speak* human language (almost always English), at least to respond to human-language commands, tests and questions. And, with a couple of notable exceptions, the precondition for this was the latter's captivity.

And that, says Denise Herzing, is what makes the enterprise that she is working on different. It is called the Wild Dolphin Project, there are 50 or 60 Atlantic spotted dolphins in the study ▷



Visitors from beyond. Denise Herzing admits to having been a little apprehensive when she first heard that a crew from *The Trials of Life* was coming to the Bahamas to film the dolphins that were so accessible to people. "It is easy to abuse that, but in fact the cameramen were great" — ie, they knew how to wait and "respect the dolphins' space." *Left:* Cameraman Peter Scoones (and ingenious rig for filming bowriding). *Above:* Mike deGruy. *Right:* Scoones.

Colourful language

Several years ago, members of a film team from *The Living Planet* were packing up their equipment in a Borneo forest when, in the gloom, one of them noticed a frog. At first glance it looked a rather drab and ordinary sort of frog, but suddenly it extended its leg and revealed a brilliant blue foot. The behaviour hadn't been seen before, but it was soon realised why the frog behaved in this manner. It lived beside a noisy waterfall and its voice could not be heard. So, in order to attract a mate it had abandoned sound and resorted to a visual channel of communication: it was simply shaking a leg.

Visual signals are instant and travel rapidly. Animals can send messages in coded movements—semaphore in the case of a leg-waving and head-bobbing lizard, a light-and-dark morse code from a flashing firefly, and body posturing by a grey reef shark that contorts into an S-shape to warn a rival.

And, six years after *The Living Planet* brought the leg-waving frog to the tv screen, *Trials of Life* is to show us, in 'Talking to Strangers', one of the most remarkable signalling systems in the natural world—the visual 'language' of cuttlefish, squid and octopuses.

It has been known for some time that cephalopods wear different colours depending on their 'mood'. An angry octopus flushes red, and a frightened one turns white. And market squid, mating in a moonlit orgy not far from Los Angeles, are coloured a delicate shade of purple as they intertwine arms and tentacles, but their bodies are flushed with moving patterns of red and maroon stripes at the moment of sexual union. And there is much more to cephalopod communication. Recent studies of the Caribbean reef squid have revealed a visual 'language' with a vocabulary that is both rich and subtle. The secret is in the skin.

Squid skin is covered with pigment cells, in which the colour can spread or disperse in an instant. Each cell is linked directly to the brain (which is larger than the brain of any other invertebrate), and so the changing patterns of colour that sweep across the squid's body provide a window on the working of the cephalopod mind. The creature is literally wearing its emotions on its skin.

Unravelling and recognising the patterns, let alone understanding the message passing from squid to squid, is not easy. They are amazingly complicated to describe, and they change rapidly and grade one into the other. There are longitudinal or diagonal zebra-stripes, dark transverse bars, spots and blotches, and moving patterns of living colour that pass from front to back and vice versa. More than 35 patterns have been recognised so far, and there are many more to unravel. It is thought that they can be combined in an infinite number of ways to form a cephalopod language, with its own syntax and grammar.

Human language has a limited number of vocal sounds, and these can be integrated in a limited number of ways. But with the subtlety of colour changes that a squid can achieve, the way neighbouring cells can be graded differently, and the fact that several colour patterns and changes can take place at the same time—something that we cannot do with our sounds—it is quite possible that these seemingly primitive creatures have a language that might rival our own.

For creatures that are distantly related to the slugs and snails, that's remarkable.

MICHAEL BRIGHT

Michael Pitts (cameraman)

Show, tell. A Carribean reef squid might talk at a sentence a flash. The orange means this, the beige means that, the speckles mean . . .

▷ group, and the human researchers are learning dolphinese from them. Using a computer as an ear (the human ear isn't quick enough or far-ranging enough), the scientists now know about 30 phrases or visual signals, including simple swimming instructions such as 'turn left' and 'dive down'. They have also learned the individual nomenclature system, which involves personal identity whistles, and a 'surname' derived from each animal's mother's whistle.

And there are other, more generalised expressions. "These seem to be more emotional," says Herzing, "an escalating dispute or escalating excitement. They definitely have certain sounds for when they feed or when they have conflicts with the bottlenoseds, when they mate, when they nurse—all those different contexts." She says that these particular dolphins, because of the extraordinary clarity of the Bahamian water, have much more visual communication—in the form of body language: the arched back, the swished fluke—than dolphins are usually expected to have. "They still have complicated acoustics, but they use a lot of visual cues." These, along with the meaningful touch—the nuzzle, the sidle—"really add to the complexity of their system."

As for relations with the local bottle-nosed dolphins, there is the expectable territorial tension, but aside from that, they seem to get along. "Nobody's really ever looked at the exact communication systems to see how much they overlap. For example, do they have the same type of sounds for the same things?"

But they do seem to communicate with each other, and they socialise. Atlantic spotted dolphins are *Stenella plagiodon*, and bottle-noseds are *Tursiops truncatus*—not just two species but two genera—and for them to share a sophisticated communication system is like people being able to have chats with gorillas (or animals even more distant, given that many primatologists believe that humans and the other four great apes should be in the same genus). What this implies is that, if there really are any Dr Dolittles in the world, they are the dolphins, and the next step in the Wild Dolphin Project would seem to acknowledge that.

So far, the team's computer has been used simply for listening and translating. Now the hardware is in place and the software is being developed for a computer that works both ways. Says Herzing, "Nowadays you can train a computer that can recognise a dolphin's sound pattern, and that would be a way for the dolphin to access us," to talk to the scientists, to phone them up.

This has worked with captive dolphins, she says, and even though the whole captivity-and-communication set-up is based mainly on dolphins adopting human language, "they seem to be pretty quick about learning associations. What we suspect is that because these dolphins are so interested in people and social interaction they may very well be interested in spending time with that system."

In Michael Bright's new book, *The Dolittle Obsession* (Robson Books, £15.95), a story is told about Skana the killer whale and Paul Spong, who has devoted his life to studying these whales (the largest of the dolphins, in fact) in the wild. It happened at Vancouver Aquarium, and it helped convince Spong that it was wrong to keep such animals in such confinement.

He was sitting on the edge of Skana's tank, doubting his doubts and dangling his feet in the water. "The whale swam up to him, turned on her side, and rasped her teeth along the bottom of Spong's foot. Shocked, he jerked his foot away. Then he put it back again and, sure enough, Skana returned and did the same thing again. Spong was a little uneasy with Skana flashing her teeth at him, but after a dozen more passes he plucked up enough courage to keep his foot in the water. At this point Skana lost interest. Spong suddenly realised that it had not been he who was studying the whale—the whale had been studying *his* behaviour."

And now it is the Atlantic spotted dolphins who have trained their humans to develop the technology to make the *real* breakthrough in this field.

DH

The special suit was meant to enable Sir David to communicate from the sea to the tv set, but bad weather intervened.

Peter Scoones (cameraman)