

INSECT SOCIETIES

CARD 19

GROUP 8: ANIMAL BEHAVIOR



A busy ant nest may appear chaotic, but each scurrying insect is performing a specific task. By dividing duties such as fighting or breeding, an insect society ensures its survival.

KEY FACTS

TYPICAL INSECT SOCIETIES

TERMITES

Each *termitaria* (city) has a queen, soldiers, and workers.
Queen: Lives at the center. Her body is a huge egg-laying machine, up to 4 inches long. She lays millions of eggs.
Soldiers: Large, dark, with extra-large heads and biting jaws. They defend the colony.
Workers: Small, white, frail. They build the nests.

ANTS

Almost all species are social. Many live in nests, or *formicaries*, with several egg-laying females, a few males, and thousands of workers.
Queen(s): Fertilized female. Lays all the eggs.
Workers: Wingless, sterile females that collect food, build the nest, and defend it against invaders. They tend the young, carrying larvae or pupae outside to warm up in the sun.

SOCIAL WASPS

Social wasp colonies may be very large, but their social structure is usually poorly developed, with only slight differences between queens, workers, and males. Social

BLACK ANT SOCIAL STRUCTURE

Male: Dies shortly after mating.

Queen ant: After fertilization she discards her wings. Her eggs develop into workers.

Worker: Sterile female tends a larva (left). Worker milks honeydew from aphids (right).

wasps build nests made of saliva and chewed wood in sheltered places, often underground. These nests have many cells to house the young.

SOCIAL BEES

Honeybees live in complex communities of up to 60,000 individual bees.
Queen: Lays eggs. One queen reigns in each colony. She is much larger than workers and lacks the special organs for pollen collection.

Workers: Collect nectar and pollen from flowers and maintain and defend the colony. They construct a comb of six-sided wax cells. These cells are used to store honey and to rear the young. The returning workers "dance" on the comb to inform other workers where food is located.

Drones: Look like queens but cannot sting and must be fed by workers. Drones help regulate the colony's temperature and mate with new queens.

DID YOU KNOW?

- A queen termite may lay 30,000 eggs in one day, and there may be seven million termites in a colony.
- The cuckoo bee lays its eggs in the nests of social bees. The cuckoo bee *grubs* (larvae) are fed by the resident workers.
- Some ants steal the young of other species and rear them for use as slave workers.
- To divert attackers from the rest of the colony, some termite workers actually blow themselves apart and cover their enemies with slime from their insides.
- A worker bee may die defending her colony, if the barbed sting is ripped out of her body during an attack.

Social insects such as ants and termites live in colonies where every individual has a clearly defined role. Each colony is tightly knit and operates as a unit, as if it were a giant multipart animal. The driving force is always the queen.

EXTENDED FAMILIES

The social insects include termites, ants, and some wasp and bee species. Each individual has a specific role and relies on the rest of the community for its other needs.

A termite colony may be defended by *soldiers* with biting jaws. But the soldiers cannot gather their own food. They are fed by the *worker* termites they protect. Neither soldiers nor workers can breed. All the young are produced by a sin-

gle *queen*, who lives at the center of the colony. She in turn relies on workers and soldiers for food and defense.

In a beehive there may be 80,000 workers. All are daughters of the queen and elder sisters of the newly hatched young. Genetically, they are almost identical twins, which gives them a powerful interest in each other. A worker bee will die defending her younger sister bee.



Left: Worker bees surround the queen honeybee. A slightly longer abdomen distinguishes her from the workers.

Right: Soldier army ants with fearsome jaws guard their colony.

Front inset left: Weaver ant workers bind a nest of leaves with silk that is made by the larvae.

Front inset right: Potter wasps gather at their nest entrance.



Left: Worker termites tend to the queen while she incubates her eggs. She cannot move because of her huge swollen abdomen.



BUILDING THE COLONY

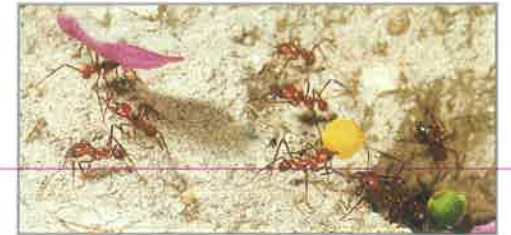
Each year the entire colony of social wasps dies out—except for the newly mated queens, who crawl into crevices for the winter. When she emerges in the spring, each queen wasp builds a cluster of 10 to 12 hexagonal cells made of wood pulp. She lays an egg in each cell, and when the *grubs* (larvae) hatch, she feeds them chewed-up insects. The grubs develop into small worker wasps that enlarge the nest.

The queen lays eggs in the cells as they are built, and the workers feed the grubs. These grubs grow into more workers, and so the colony expands.

A honeybee colony develops similarly, but ant and termite

Left: Surrounded by workers, winged adult termites prepare to leave the nest and find a mate.

Right: Leaf-cutter worker ants carry their "harvest" to the nest. They cultivate a fungus on it that the colony can eat.



COMMUNICATION

Social insects must exchange information all the time. One way they do this is by body language. A honeybee, for example, performs a "dance" to point the way to a rich nectar source.

If a foraging ant discovers a good source of food, it lays a scent trail. Others follow the trail and add their scent to it to attract still more ants.

These scents are called *pheromones*, and they play an important role in insect societies. Wasp grubs demand food by emitting a pheromone that signifies "feed me." The queen has a distinctive scent of her own that keeps all the workers at their tasks. They touch her regularly and douse themselves in her scent. If she is

removed, the workers may lose all sense of purpose.

Worker bees who lose their queen rear a replacement in a special "queen cell." But if a queen is still active, her pheromones prevent any replacement of her. They also keep the workers from becoming sexually active, because all the females in the colony have the potential to become queens.

Pheromones occur in ants and termites as well as bees and wasps. Every egg is the same, but when it hatches the larva takes in pheromones with its food. These pheromones determine its future role. A termite may develop into a worker, a soldier, a fertile male, or a queen—it all depends on the pheromones.



Left: The queen paper wasp uses chewed plant pulp to build a basic nest with a six-sided chamber for each egg. Other females assist her by adding to the nest structure and helping to feed the first generation of larvae.

BIRD COURTSHIP

CARD 15

GROUP 8: ANIMAL BEHAVIOR



Birds perform elaborate and showy courtship rituals. Serenades, intricate dances, and the display of exotic plumage are all part of the contest to attract a mate.

KEY FACTS

BOWERBIRD COURTSHIP

The male bowerbird of New Guinea and Australia creates elaborate nests during breeding season to attract a mate. These nests serve only as areas for courtship display and are used and improved for several years.

The bowerbird chooses an open site among the trees, and sweeps it clear of leaves. The bird then builds the structure (*bower*) from carefully chosen twigs that he

sticks firmly in the ground.

The enclosures' shapes differ by species. For example, the gardener bowerbird builds circular hutlike bowers, often around the trunk of a small tree. The bower's floor is decorated with brightly colored flowers and fruit.

Another species builds an open-topped structure made from two rows of twigs three feet long and six inches

wide. The whole area is decorated with such objects as bleached bones, feathers, shells, fruits, and petals. Some birds even paint their bowers with the juice of berries.

The male bowerbird entices a female to his completed structure and dances before her, displaying himself and the objects he has collected. After mating, the female builds herself a separate nest for her eggs.



Left: Satin bowerbirds decorate their nests to attract mates.



Right: The great bowerbird decorates his nest with curious objects and bright flowers.

COMPETITIVE COURTSHIP

Some game bird species such as the capercaillie and grouse perform communal courtship rituals.

Prior to the breeding season, both males and females gather at sites called *leks*, which the birds use annually for the males' display activity to attract females. The males

strut and puff out their beard feathers while performing songs of clicks and rattles.

Below: Capercaillies display with songs of clicks and rattles.



Front cover: The frigate bird puffs up its pouch for display.

Front inset: The crowned crane performs its courtship ritual.

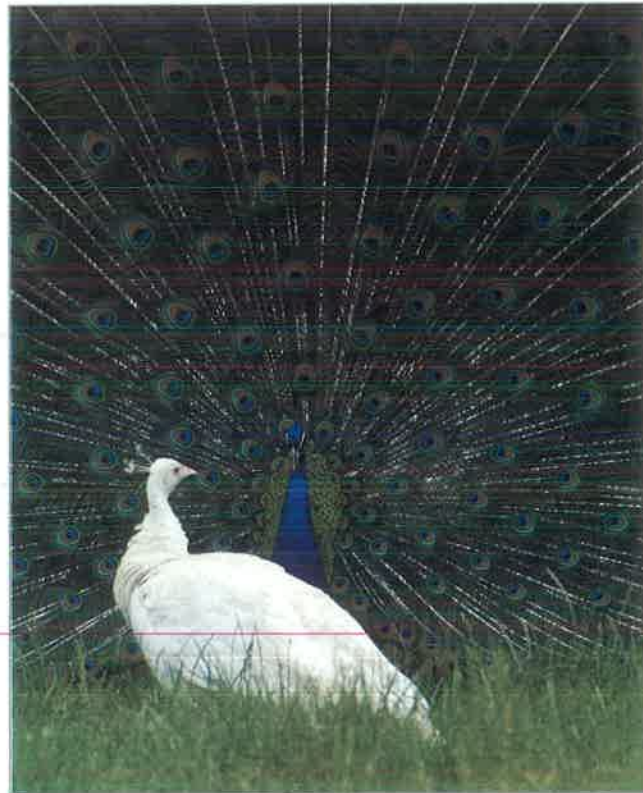
The females watch the display, sometimes from their perches in the branches of a nearby tree.

The males occasionally fight each other, stabbing with their beaks or leaping into the air and crashing their wings together.

The dominant birds will eventually occupy the central areas of the leks; the females then join them and they mate.

Courtship displays perform

several different functions, from identifying a bird's species and sex to helping individuals choose a partner. They also help strengthen pair bonds and ensure that both birds are ready to breed at the same time.



MALE DANDIES

Usually it is the male that plays the leading role in courtship by showing off his plumage to the duller-colored females. For plainer birds such as the house sparrow, the male's display may consist of puffing out his chest or tipping back his head to emphasize his dark bib.

Exotically feathered species such as the male peacock often put on a stunning display. The male peacock will fan his tail to present a dazzling array of blue, green, and golden feathers in one of the showier displays of any bird.

The male mandarin duck develops impressive golden "sails" from enlarged tertiary flight feathers on its wings and long, chestnut-colored whiskers on either side of its brightly colored head.

Not all birds rely on colorful feathers to impress potential mates. The blue-footed booby, for instance, performs a courtship dance to display its brilliant blue, webbed feet to its intended mate.

Left: A male peacock displays his magnificent plumage to the less showy white-feathered hen.

COURTSHIP VARIETY

Every species of bird performs a slightly different courtship ritual. These differences help to ensure that only birds of the same species will mate. Males and females also perform different and complementary roles, thus only attracting members of the opposite sex.

Before mating season, many male birds grow colorful

plumage. They then show off to attract a mate.

Birds that are less colorful, such as species of the warbler, show much less variety of plumage between the sexes. Instead, they use extremely complicated and individual songs to identify themselves and to attract a mate.

MUTUAL DISPLAY

Plumage of similar color across the sexes means that they are more equal in their courtship displays. Albatross, for example, perform complex joint rituals which look like a courtly dance. The longer the display lasts, the closer the bond formed between them.

Some species perform courtship displays in the air. Lapwings try to impress their mates by tumbling through the air as if they were about to crash. Male skylarks fly high into the air singing loudly.

Many birds of prey court each other by displaying their hunting skills in mock aerial combat. The female peregrine falcon will often fly on its back as the male swoops

Below: Male albatross' courtship rituals are very complex.



GIFT GIVING

Many birds perform a ritual known as courtship feeding or gift giving. Usually the female will spread her wings and open her beak, behaving like a young bird begging for food. This ritual not only allows her to build up her strength for the demanding job of laying and incubating the eggs, but it also assures her that the male will

be a good provider for the chicks.

Instead of food, some species of bird present their partners with nesting material. Herons give their mates large twigs which are offered up with ceremonial bowing. Gift giving is probably a symbolic show of the male's nest-building abilities.



Above: A blue-footed booby displays his brilliantly colored feet to the female.

overhead; the pair briefly touch claw to claw. The male may even pass food to the female during similar encounters.

Birds often begin their courtship awkwardly. They become more skillful as they progress. Once the ritual is performed perfectly, the birds will often mate. Mating is not the only goal of the

courtship ritual, however; many pairs remain together to share the tasks of building nests, incubating eggs, and raising young.

Below: The male mandarin duck is set apart by his colorful plumage.



DOMESTICATION OF ANIMALS

CARD 13

GROUP 8: ANIMAL BEHAVIOR



Domestication was started by our early ancestors who realized the potential of certain wild animals to perform tasks and provide humans with a reliable source of food and clothing.

KEY FACTS

THE CONSEQUENCES OF DOMESTICATION

Animal domestication has led to the existence of a wide variety of breeds. More than 200 breeds of dog descended from the wolf.

The domestication of animals has changed mankind's way of life significantly. Domesticated dogs and horses helped people to round up herds, enabling them to build permanent settlements that later evolved

into towns and cities.

As domestication became more sophisticated, animals were bred to produce more meat, milk, or wool. This created certain breeds of cow and pig that are totally reliant on humans for their day-to-day survival.

Right: A beekeeper provides the honeybee with a home and is rewarded by a supply of honey.



CAN DOMESTICATION BE REVERSED?

Whether or not domesticated animals could survive on their own depends on their degree of domestication. A hardy breed of hill sheep that still retains its wild survival instinct would probably do well on its own. But the large white pig, which has been bred to produce large amounts of meat, does not have the ability to fend for itself.

Formerly a domesticated

Below: The cat was originally domesticated by the ancient Egyptians.



Left: In the case of reindeer, domestication has been very slight. This animal's natural ability to survive harsh conditions makes it valuable.

animal, the Australian dingo escaped into the wild and quickly reverted to its wild state. Many colonies of feral (returned to the wild) city cats have behavior patterns

much like the wildcat's.

But certain breeds of pet would have difficulty surviving in the wild because they have become too tame to compete with other animals.



SOME DOMESTIC ANIMALS AND THEIR ORIGINS

Domestic Animal	Ancestor	Where Found Wild Today
Dog	Wolf/jackal	Europe/Africa
Cat	African wildcat	Africa
Horse	Asiatic wild horse	Soviet Union
Sheep	Urial	Southwest Asia
Cattle	Aurochs	Extinct
Rabbit	Wild rabbit	Europe
Pig	Wild boar	European forests
Goat	Persian wild goat	Crete/Turkey
Chicken	Red jungle fowl	India
Pigeon	Rock dove	Europe

The effects of domestication vary in different animals. The dog bears little resemblance to its ancestor, the wolf, yet still retains some of the wolf's wild instincts. The pig, on the other hand, bred purely for its meat, has none of the natural instincts of its predecessor, the wild boar.

ORIGINS OF DOMESTICATION

Wild animal domestication began in 9000 B.C. when nomadic tribes started building permanent settlements and herding together animals they had previously only hunted. Mainly mammals and birds were domesticated to provide meat, milk, and eggs as well as wool and hides. Larger mammals were used to carry or pull heavy loads.

Hunters first used the dog to track down and kill other wild animals. It also provided protection and gradually evolved into a companion. Certain breeds of dog were bred for their appearance and do not look similar to their ancestor the wolf, but some breeds

retain wolflike features. Still, even dogs that look different share common ancestors. For example, the closely related but different-looking rottweiler and chihuahua were carefully bred to fulfill different purposes for their owners.

The cat was domesticated for its beauty, but it developed into a rat-catcher. The cat's ancestor was probably the easily tamed African wildcat rather than the untamable European cat. The ancient Egyptians mummified cats in their royal family tombs.

French monks domesticated the rabbit before 1000 A.D. The rabbit's rapid reproduction provided meat and fur.

Right: The yak's hardiness makes it ideal for Tibetan hill tribes.

Front cover insets: Since early times, the dog has been "man's best friend." The blackface sheep is bred for its fine wool and meat.



CAN ALL ANIMALS BE DOMESTICATED?

Many species' wild instincts make them impossible to domesticate. Attempts to domesticate the zebra have failed.

Other wild animals are kept as pets. Indian princes used the cheetah for hunting, and the hyena is kept as a guard

in some parts of Africa. These animals are not truly domesticated and will go wild if they escape. Even household pets such as the guinea pig and hamster must be caged to keep them from escaping.

Right: Attempts to domesticate the zebra have failed.



Above: The honeybee is the only insect successfully domesticated by humans.

Left: Humans exploited the wolf's natural skills and created a perfect hunting companion.

Below: Przewalski's horse is the only completely wild horse left.

THE HORSE

Today's different breeds of horses evolved from herds of wild horses that roamed the plains of Asia. The first people probably hunted the horse for its meat, as they did with most large, herd animals. They eventually began using it as a beast of burden and a means of transportation. The rare Przewalski's horse is the only true wild horse to survive today.

Selective breeding changed the wild horse's appearance as an adaptation for its specific use. For example, the heavy shire horse that pulls carts and plows and the sleek race horse are adapted for different purposes.



SOME UNUSUAL DOMESTIC ANIMALS

Alpaca: Kept for its wool and used as transportation.

Bees: Until the discovery of sugar refining 200 years ago, honey was the only known sweetener. The wax produced in the combs was used in medicine.

Camel: Kept as a pack animal in Africa and Asia. They were introduced into Australia where today they roam wild.

Elephant: Kept as a worker in India, the Asian elephant moves trees and heavy objects.

Goldfish: One of the very few domestic fish, they were kept by monks for food.

Llama: Pack animal in the Andes, South America.

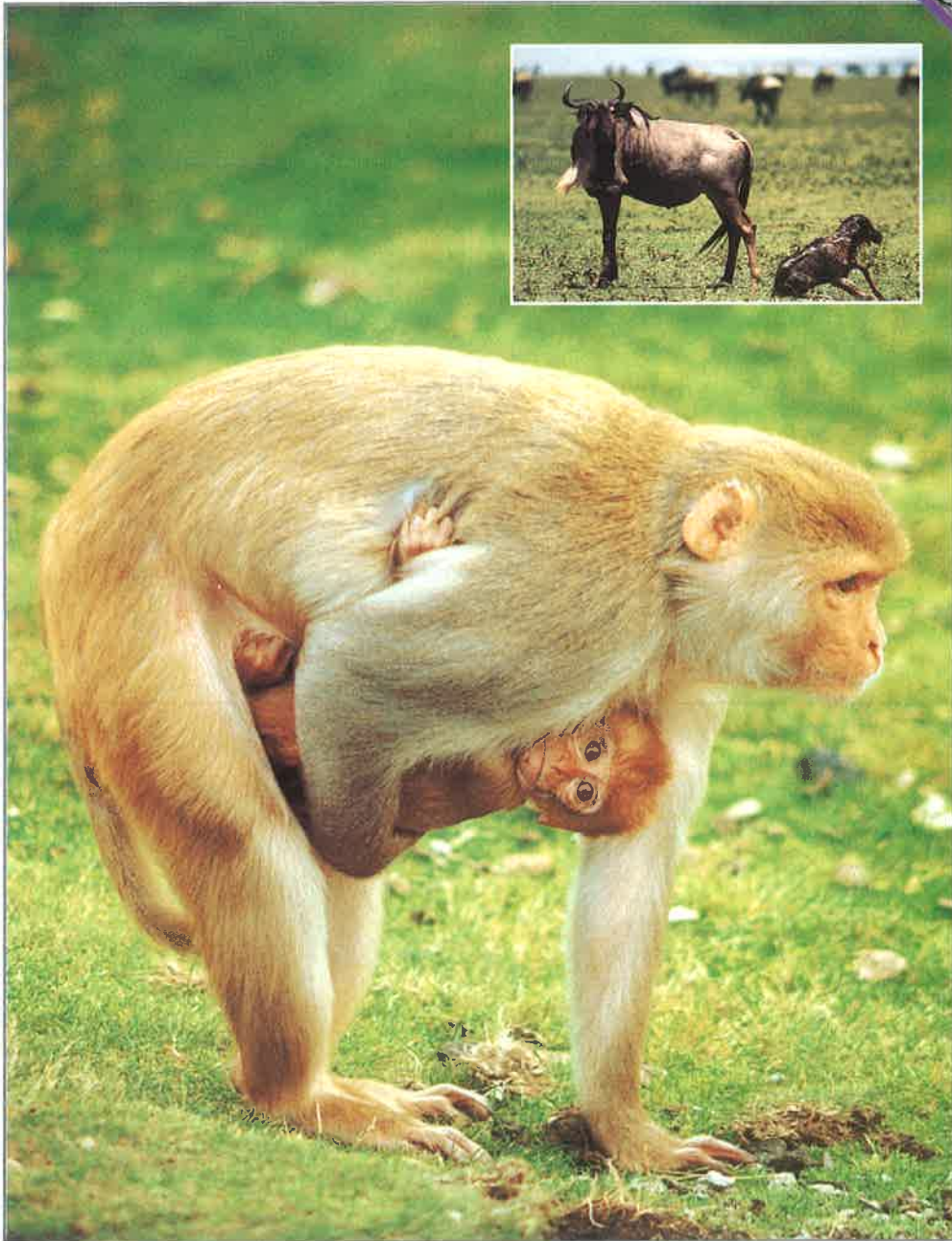
Reindeer: Farmed by the Laplanders for food.

Yak: Used in Tibet as a pack animal and for meat.

EDUCATION OF YOUNG MAMMALS

CARD 11

GROUP 8: ANIMAL BEHAVIOR



Baby mammals learn from their parents in different ways according to their habitats and lifestyles. In its early days a young mammal learns new skills critical to its survival.

THE INTELLIGENCE OF PRIMATES

Of all the primates, the chimpanzee resembles man the most. It is one of the few mammals to use tools. A young chimp learns by watching its mother. It is soon able to use a twig to dig for insects. Following its mother's example, the chimp breaks off leaves and buds to make the twig easier to use.

Primates live in groups with a social hierarchy and communicate with each other by using body language as well as vocalization. They communicate emotion through facial expressions. For example, a grimace is a sign of anger.

From birth, young primates cling to their mother's fur, and from this position they learn how the others in the group behave. Monkeys, like humans, must learn how to walk. A female rhesus monkey

Right: Like man, the chimpanzee uses expressive body language to communicate.

Below: Taught by its mother, a chimpanzee soon learns how to hunt for food.



teaches her baby to walk by sitting it down and walking away from it. If the baby does not move to follow her, she

prods it into action before finally gathering it into her arms. She repeats the lesson until the baby can walk.

ANIMAL TRAINING

Many experiments have been performed to determine the intelligence of animals.

Squirrels are able to complete difficult obstacle courses in order to reach food. Primates are capable of learning human language and can be trained to help disabled people in their homes.

Almost all animals have the same needs for essential food and shelter. The promise of these can motivate an animal to learn new skills.

Right: Trained dolphins respond to a handler's orders and put on displays that educate and entertain.



Mammals have evolved over thousands

of years, each adapting to its own

environment. Much of a young

mammal's behavior is instinctive.

But it learns still other behaviors from

its parents and through experience.



LEARNING ABILITIES

The intelligence of mammals varies from species to species, with some having a greater capacity for learning than others.

Front cover: A female rhesus monkey carries her young until it is ready to walk.

Inset: A young wildebeest takes its first step.

Monkeys and apes are among the most intelligent mammals; the chimpanzee's intelligence is believed to be the most similar to man's. Other mammals, such as rabbits, are of low intelligence and survive mainly by instinct. Still, instinct is just as important as intelligence.

In the case of rabbits, instinct ensures their survival as a species. Though they are a favorite food of many predators, they flourish because of their rapid breeding rate.

Above: Two young elephants play fight. They use their tusks, which become entwined in mock battle.

LEARNING TO HUNT

Mammals have to make quick decisions. A predator has to learn how to catch its prey or it will starve.

Wild cats and dogs learn how to hunt from their parents. A mother cat brings live prey home so that the young

can learn how to kill. Later, they follow their mother on hunting trips and hunt and kill for themselves. Many dogs hunt in packs, and it is important that skills are well learned, since a mistake could cost the entire pack a meal.

LEARNING THE LANGUAGE

Many mammals "talk" to each other. Among the most vocal are the primates and marine mammals such as dolphins and whales.

Whales and dolphins that live in groups have a vocabulary that they use to identify themselves as well as approaching predators and the location of food.

A young whale stays close to its mother for over a year and learns to communicate with her and the rest of the group. Each species communicates using its own dialect.



SOCIALIZATION

Mammals that live in groups or have more than one young at a time must learn social skills from the others.

Young mammals often play at fighting. This prepares them for adulthood and teaches them their place in the group.

Meerkats, for example, live in complex groups, depending on teamwork for survival. Older meerkats show the young how to catch scorpions, watch the young, keep guard, and bring back food to newborn meerkats.

Top: Lion cubs learn how to kill from their mothers.

Above: These two brown bears play-fight with each other.

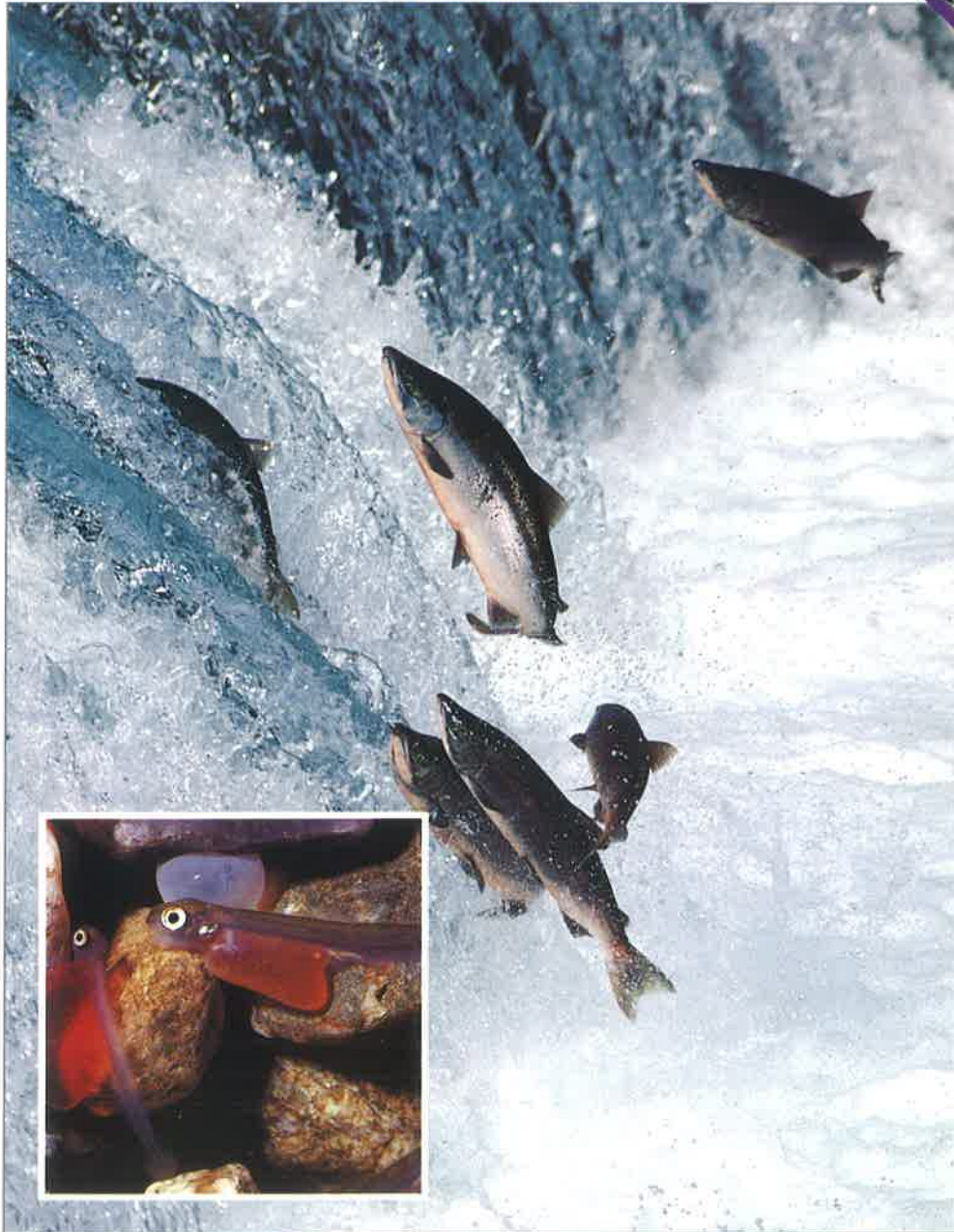
Right: Mock fights prepare young mammals for adulthood.



FISH MIGRATION

CARD 10

GROUP 8: ANIMAL BEHAVIOR



Many fish undertake vast migrations across oceans. Some species even travel between rivers and oceans. Why do fish migrate, and how do they find their way?

KEY FACTS

EEL MIGRATION

For centuries little was known about the European eel's breeding habits. *Evers* (young eels) swam upriver where they gradually developed into adults. They fed in the fresh water for several years before they became sexually mature, at which time they began swimming downriver toward the sea. When they reached the sea, people were no longer able to track them.

Years of patient research determined that once the eels left the rivers they migrated to their *spawning*, or breeding, grounds. Their migration carried them 3,700 miles from the coasts of Europe to the Sargasso Sea, a region of calm water in the North Atlantic northeast of the islands of the West Indies.

How the eels find their way to the spawning grounds is still unknown. Since birds appear to migrate by following the earth's magnetic field, some scientists believe that migrating eels do the same. Alternatively, they may be



Above: The migratory instinct is so strong that eels travel across land if necessary.



Left: Young eels rest on the journey to their feeding grounds.

sensitive to changes in the water's temperature, pressure, or scent, which they use to help them navigate.

The eggs are laid in the warm (68° Fahrenheit) waters at depths of more than 1,000 feet; the Sargasso Sea is one of the few places in

the world where this is possible. Since the adults do not eat during the six-month migration, they die after spawning. The eggs hatch into leaf-shaped larvae that drift slowly east with the currents, arriving on the coasts of Europe two years later.

TRACKING MIGRATION

Little is known about fish migration; still, it is becoming easier for scientists to track the fish as technology advances. Tracking is done by using transmitters. The type of transmitter used depends on the location and the kind of fish being followed.

A common method for

tracking fish is to attach an acoustic device to the fish externally or insert it in a body cavity. The device emits ultrasound pulses, which are then converted into sounds that humans can hear. The signals are monitored from either a boat or a riverbank, and they usually have a maxi-

mum range of half a mile.

Using such tracking devices allows scientists to learn more about fish migration. Much of the tracking requires that the fish be followed closely by boat, but computers and other automated equipment are being developed to make it easier to gather information.



Fish migrate down river and across the sea to reach their feeding grounds. During the breeding season, the fish make a return migration to their spawning grounds, since the young must hatch in the calmer waters of a lake or riverbed.

WHY MIGRATE?

Fish migrate to find food or breeding sites. Many feed on the seasonal growth of microscopic plants and animals, called *plankton*, or prey on smaller, plankton-eating fish.

During the breeding season some species migrate to special spawning grounds to

lay their eggs. The spawning grounds are located far from the feeding grounds because the young fish have different feeding requirements from the adults. The distance also lessens the chance that the adults will eat their own young.

RIVER MIGRATION

Most migrating fish move from one ocean to another, but some travel from rivers to the sea. Brown trout, for example, swim downriver each spring to feed in the sea. Fish that migrate from fresh water to salt water must adapt to the change. But the

greater availability of food in the ocean allows them to grow twice as large as the freshwater fish.

The brown trout return to the rivers to *spawn* (breed) because their eggs must be laid in shallow fresh water.

NAVIGATING THE OCEANS

Salmon navigate by smell. Each fish remembers the scent of the stream where it was hatched. As it migrates back across the ocean toward the spawning river, the fish instinctively finds its way as the familiar scent grows stronger.

Sea trout also use their sense of smell to navigate, but they are not as able as salmon to follow a scent. If a migrating sea trout is caught and taken beyond its home range and then released, it becomes lost.

SALMON MIGRATION

Salmon are born in fresh water but spend nearly half their adult lives feeding in the ocean. Some salmon travel thousands of miles through the ocean to reach the spawning rivers. The upstream migration to the spawning grounds occurs only once in the lifetime of most salmon.

When they reach breeding age salmon migrate thousands of miles to reach the spawning grounds. Once they arrive at the river's mouth, they gather in the *brackish* (slightly salty) water and wait for high waters to carry them

upstream.

The journey upstream may take several months. The fish must often leap over waterfalls and rapids to reach the shallow spawning streams. Because the salmon do not feed in fresh water, they have lost 40 percent of their body weight by the time they lay and fertilize their eggs. Most of the salmon then die.

Top: Thousands of salmon spawn in an Alaskan stream.

Right: At the end of a long journey, salmon become easy prey for bears.



ADAPTATIONS OF MIGRATING FISH

Migrating fish must adapt to moving between freshwater rivers and the much saltier oceans. In fresh water the body fluids of a fish are more salty than the water in which it swims.

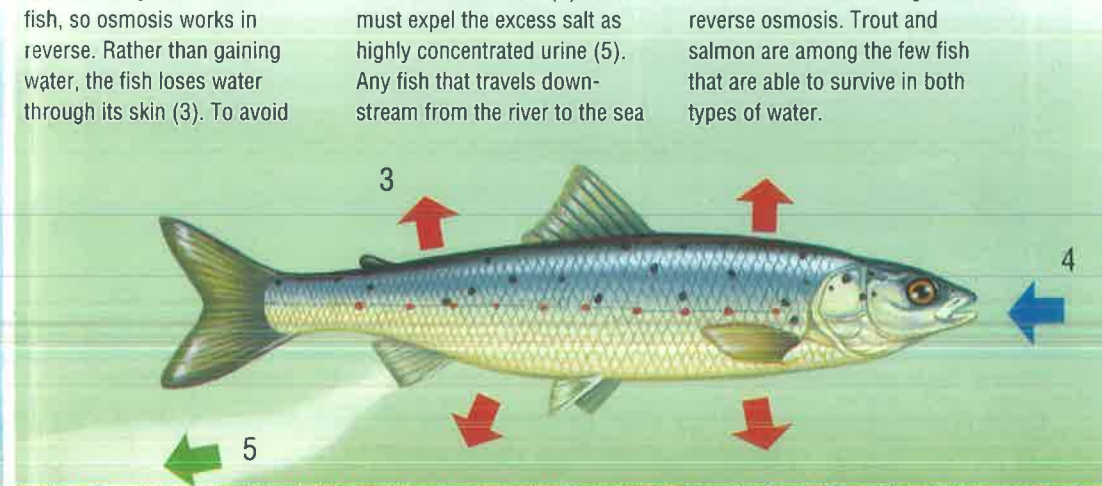
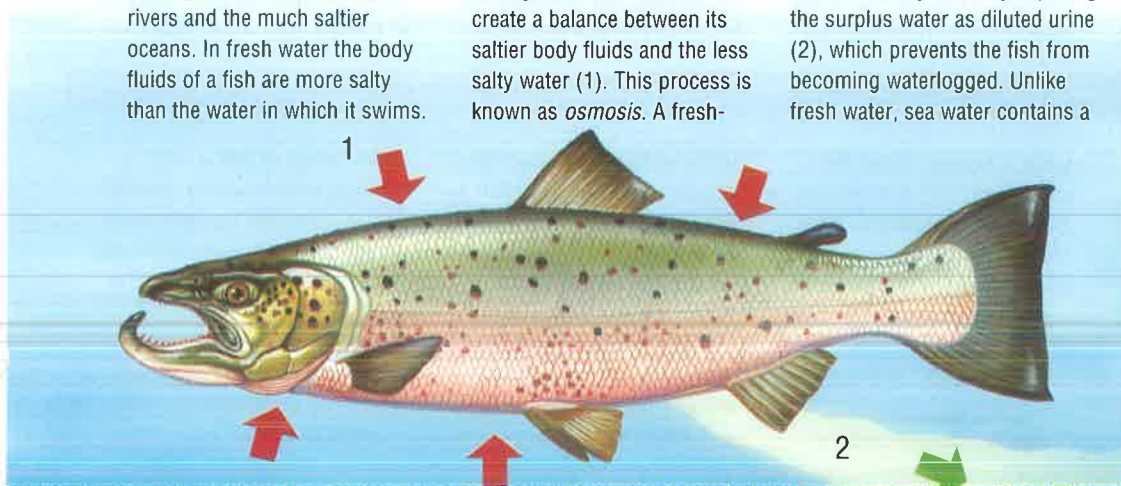
As a result, water seeps through the fish's skin to create a balance between its saltier body fluids and the less salty water (1). This process is known as *osmosis*. A fresh-

water fish maintains the concentration of its body fluids by expelling the surplus water as diluted urine (2), which prevents the fish from becoming waterlogged. Unlike fresh water, sea water contains a

higher concentration of salt than the body fluids of most fish, so osmosis works in reverse. Rather than gaining water, the fish loses water through its skin (3). To avoid

dehydration (drying out), the fish drinks sea water (4) but it must expel the excess salt as highly concentrated urine (5). Any fish that travels downstream from the river to the sea

makes the transition from fresh water to salt water through reverse osmosis. Trout and salmon are among the few fish that are able to survive in both types of water.



COURTSHIP RITUALS OF REPTILES

CARD 8

KEY FACTS

GROUP 8: ANIMAL BEHAVIOR



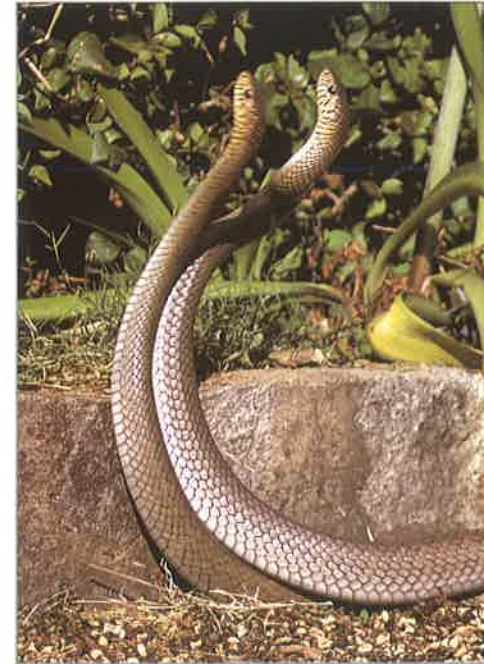
Reptiles exhibit a wide variety of courtship behaviors: some actually change color or shape, while others become defensive and aggressive.

SNAKE COURTSHIP

Snakes lack the frills, crests, and changeable colors that other reptiles use for visual display during courtship rituals. Instead, snakes attract each other by giving off, or *secreting*, a chemical substance through their skin. This chemical, called a *pheromone*, enables them to communicate with other members of the same snake species.

For example, when they are ready to breed, female adders secrete a pheromone as they pass through the undergrowth. The male adder can identify the pheromone by collecting the scent with his tongue. He transfers it to two sense organs on the roof of his mouth, called the Jacobson's organ. The male determines the female's direction and follows her. He occasionally flicks his tongue into the air to ensure that he is still on the female's track.

In the fall, the North American red-sided garter snake forms hibernating colonies of a few females and several hundred males. During mating,



Left: The mating ritual of the greater Indian rat snake is long and elaborate. The male and female snakes writhe and entwine each other in their coils. After about an hour, the female finally allows the male to mate with her.

between 30 and 100 red-sided garter snake males gather around each female.

The group of snakes becomes a twisted, squirming mass as each male tries to position himself for mating. At the height of mating season, the ground may be covered with many masses of snakes.



Above: Chin rubbing is part of the garter snake's mating ritual.

Left: The mass of coiled garter snakes breaks up after the female has mated.



DID YOU KNOW?

- The male Texas banded gecko attracts a mate by striking her gently with his tail and licking her sides.
- The marine iguana normally has gray-brown skin. During the mating season, the iguana develops red spots on its skin.

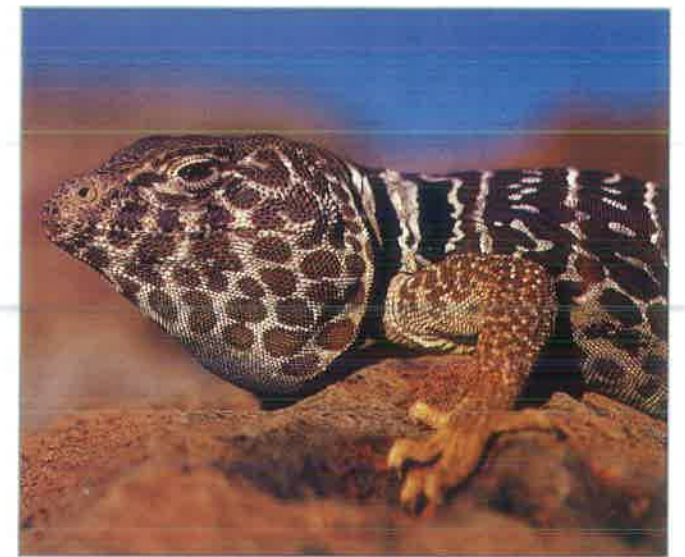


COURTSHIP BEHAVIOR

Reptiles use a variety of behaviors and displays for courting. These may include unusual changes in shape and color.

The male eastern fence lizard moves his body to show off bright blue skin on his throat and stomach. If the female is not ready to mate, she arches her back, raises herself off the ground, and jumps away sideways.

Left: *The male iguana displays bright stripes when courting.*
Right: *The collared lizard is one of the fiercest lizard species.*



Fights are frequent among rival male reptiles during breeding season. Many of these fights are only ritual shows of strength, but in several species they can be dangerous and even fatal.

RITUAL FIGHTS

Many reptile courtship displays are nothing more than ritual fighting between rival males. They threaten each other by changing shape and color or by producing loud noises. They also use threatening behavior, such as lunging toward an opponent and acting as if they are biting. These contests are often only ritual shows of strength, with each male trying to gain

dominance over the other. The male common agama lizard threatens a rival by bobbing his head. If the rival remains, the agama rears up on its hind legs while its body becomes pale and spotted. After this display, the rival males lash out at each other with their muscular tails until one retreats.

Right: *Two male emerald lizards fight over territory.*
Front inset left: *Alligators court at night.*
Front inset right: *The anole's inflated throat sac frightens off rival males.*



TERRITORIAL DISPLAYS

Many species of reptile—especially lizards—become more territorial at the start of breeding season. The males' displays are intended to frighten away other males.

The Australian frilled lizard raises a wide collar, or *frill*, of skin around his neck. He also

shows off his powerful teeth and a bright red mouth.

The territorial green anole lizard often expands his territory up to 20 times when he is ready to mate. He threatens intruders by inflating a throat sac that has patches of bright red and blue skin.

Males of other anole species raise crests on the backs of their necks and inflate throat pouches while making loud noises.

Left: *A male Australian frilled lizard raises a collar of skin to frighten a rival.*

BREEDING

The Nile crocodile mates when it is five or six years old. At the start of each mating season, males share their territories along the riverbank with females and immature males.

The male selects a female and displays by thrashing his tail and snout through the water. The pair swims in circles, with the male on the outside as he approaches the female.

Alligators also mate in the water, but usually at night. The male attracts a female by opening his jaws and roaring and by giving off a scent from glands in his throat.



Left: *Vicious fighting often occurs as male Nile crocodiles establish their territories.*