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ABSTRACT

This document provides science curriculum instructional material relating to marine biology. Items presented relate to live animal exhibits seen during visits to Sea World marine aquarium exhibits; however, all materials are also useful for in-class instruction without visits to Sea World displays. Ideally, material should be reviewed immediately prior to a Sea World exhibit. This unit has a theme of behavior and includes transparencies and information sheets on whales and killer whales. (SL)

SEA WORLD Curriculum Guide

Program Theme: BEHAVIOR K-3

A SEA WORLD EDUCATIONAL PUBLICATION
Courtesy of Atlantic Richfield Company

KILLER WHALE FACT SHEET

SEA WORLD EDUCATION DEPARTMENT

1974

KILLER WHALE INFORMATION SHEET

I. Scientific Name-*Orcinus orca*

A. Belongs to the scientific order *Cetacea*

B. Belongs to the sub-order *Odontoceti* or toothed whales

II. Distribution

A. All oceans of the world

B. Most numerous in areas of cold waters (Artic and Antarctic) and areas of cold water upwelling. These are areas of abundant food production due to the upwelling of nutrient-rich water.

C. Generally found equally in open ocean and coastal waters

III. Size

A. Males as large as 31 feet; females up to 27 feet

B. Weight-males up to 18,000 pounds; females up to 10,000 pounds

C. Weight at birth--300-400 pounds or more

D. Length at birth--depending on geogrpahic locale 6-8 feet

IV. Description

A. Easily recognized by the striking body colors and prominent triangular dorsal fin; dorsal body and pectoral flippers black, ventral surfaces and lower jaw white--distinct boundary between black and white; white oval spot located above and slightly behind eyes (resemble a large eye from a distance); just behind dorsal fin there generally is a pale gray blaze or saddle (this gray may vary in intensity), and the undersides of tail flukes are usually white, trimmed with black

B. Color of young--black and creamy white to lemon yellow--usually turn white by 1-2 years of age

V. Fins, Flippers, and Flukes

A. Pectoral flippers--Comparable to other mammalian forelimbs (similar bone structure)-used for steering and stopping, are rounded not pointed, may reach 6 1/2 feet long and 4 feet wide in large male

B. Dorsal fin--Triangular-shaped fin on top of body, used for stability while swimming--may reach height of 6 feet in adult male; 3-4 feet in adult female

C. Tail fluke--Hind limbs have disappeared; instead tail flukes have evolved for swimming-each side or lobe of tail is called a fluke; tail flukes used in up and down motion to provide power for swimming; adult male's may measure to 9 feet tip to tip

VI. Feeding Habits

A. Most common number of teeth is 48, but may have 40-50 teeth depending on the size and genetic background of whale

B. Teeth cone-shaped, designed for grasping, ripping, and tearing, not chewing; teeth are 3 inches long, 1 inch in diameter, interlock when jaw closed

C. Food swallowed whole or bitten into large chunks, not chewed

D. Primary food is fish such as salmon, cod, flat fish, hake, halibut, etc.; also feed on squid, other cetaceans, seals, sea lions, walruses, and sea otters

E. Hunt in packs in cooperative effort, encircling and herding prey into small area before attacking

F. Generally prey on young, weak, old, or sickly animals

G. Known to surface under ice floes to knock prey into water

H. Can slide out on sand bars or ice floes in pursuit of prey

I. Much quoted account of finding 14 seals and 13 porpoises in the stomach of one killer whale is misleading-actually D.F. Eschricht in 1862 found fragments of skin and bones of these animals, but these represented animals eaten over an unknown period of time

J. Are a top predator in the ocean food chain-their numbers and distribution governed by food supply and population density

VII. Reproduction

A. Specific breeding data on killer whales is undetermined

B. Current Information

1. Killer whales under study are probably seasonally polyestrous, ie., during certain seasons of the year they will come into estrus several times

2. Most common periods of estrus are probably in the fall and spring.

3. World wide data indicates young born at various times during the year

4. It is possible that in the wild breeding may occur in any season

5. Females reach sexual maturity by 4 years; it is thought males do not reach sexual maturity until almost twice this age

C. Gestation--unknown--perhaps 13-16 months like some other whales

D. No more than one calf born per year

E. Calves born in water, usually tail first, are nursed a year or more--milk ejected directly into calf's mouth

VIII. Longevity--A few individuals could live up to 35 years; average adults likely 20-25 years; mortality in the wild very high, especially in the young

IX. Swimming and Diving Ability

A. Can attain a speed of about 30 mph in the open ocean and is one of the fastest marine mammals; usually cruise at much slower speeds of no more than a few miles per hour

B. Are very agile and maneuverable in water

C. Breaching (jumping clear of the water) and spy hopping (hanging vertically in the water with head above water) are common

D. Most dives are 30 seconds or less, but dives of up to 5 minutes have been observed. Scientists now believe even longer dives up to 10-12 minutes are possible.

X. Social Behavior

A. Very social not solitary in habits

B. Live in groups called pods consisting of a lead bull, immature bulls, cows and young--size of pods vary from small family group to 40 to 50 individuals

XI. Communication

A. Being highly social and living in groups, they need only relatively short range communication

B. Types of Communication

1. Sound--produce two types of sounds in the blowhole and nasal passages

a. Lower frequency sounds primarily within the human hearing range

1. Pulsed sounds like the "bark", "grunts", "squeaks", and "squaks") of other mammals

2. Quasi pure tones or whistles

3. Both type sounds are thought to be used to convey moods, physiological state, location, and identity of one whale to the other members of the pod

B. Higher frequency sounds primarily above the human hearing range

Echolocation--are pulsed sounds, they are very brief, sharp-onset clicks, given in slow to moderately rapid sequence; sound like a "rusty hinge" or "creaking door"

1. So far as is known can be produced within the head without loss of air

2. Thought to be produced inside the nasal passages and sinus cavities

3. Believed to be transmitted through the melon region (a spongy, oil-filled area of the forehead) This melon acts as an acoustic lens in directing sounds.

4. Used to locate relevant objects in their underwater environment

a. The whale listens for his echolocating sounds to bounce back (or echo) to him

b. How fast these echos return and from which direction tells the whale the size, shape, density, and location of underwater objects

2. Other Forms of Communication

a. Slap water with flukes-produces sonic report heard in and out of water (thought to indicate agitation or warning)

b. Lift flukes-(animal threatens to splash or hit)

c. Snapping jaws-(thought to indicate displeasure)

d. Loud, explosive exhalation-(communicates undetermined state)

e. Emit large bubble of air under water-(thought to indicate begging or inquisitiveness)

XII. Senses

A. Sight

1. Eyes located toward front and below the small white "eye" patch

2. Eye covered with a jelly-like mucous substance (looks like a tear) to protect eye from salt water

3. Eye movements coordinated suggesting stereoscopic vision

4. Acuity unknown

a. Near vision probably good

b. Distant vision undetermined but Shamu has been observed to roll on her side to "watch" planes fly overhead

5. Night vision appears well developed-Shamu frequently trained at night with no light except moonlight, starlight, or dark night sky

B. Smell-anatomy of odontoceti brains indicates they cannot smell

C. Taste-Anatomy of odontoceti brains indicates they can taste

D. Touch-Thick skin would seem to limit sense of touch, but observation indicates sense of touch is highly important and is well developed

E. Hearing-Most highly developed sense

1. External ear opening-found a few inches behind each eye on sides of head-more sensitive to lower frequency sound waves

2. Lower jaw bone-also believed to be a receptor of sounds but of higher frequencies used in echolocation

XIII. Heart Rate

A. Larger animals have slower heart rates-Namu, a 24 foot male, had a heart rate of 60 beats per minute at the surface while breathing, and a slowed rate of 30 beats per minute while diving-(this reduction in heart rate is common in all marine mammals)

B. Smaller animals have faster heart rates-Shamu, at 13 feet 6 inches, had a heart rate of 48 while diving and a rate of almost twice that while breathing at the surface

XIV. Respiration

A. At the Surface

1. Breathing cycles are repeated throughout the day and are predictable.

2. Namu was observed to breathe about every 56.6 seconds while in his floating pen enroute from British Columbia to Seattle or roughly a little better than 1 breath per minute

B. Diving

1. Observed killer whales usually surface every 4-5 minutes taking 2-5 breaths at 5-10 second intervals

2. Longest observed dive in wild is 12 minutes

3. Under controlled experimental conditions killer whales have made dives lasting up to 15 minutes

XV. Sleep

Undertermined-probably a state of semi-alert dozing to allow for respiration (respiration is voluntary in killer whales, not involuntary like land mammals and man); This semi-alert state also allows the animal to remain aware of his surroundings, while obtaining required rest.

XVI. First Healthy Killer Whales in Captivity

A. On June 23, 1965, two killer whales were found in drift nets in Fitz Hugh Sound, British Columbia; The smaller whale escaped two days later and the larger one, named Namu for the British Columbia cannery town near which he

was captured, was 24 feet long, weighed 10,000 pounds, and was estimated "to be a teenager". He was sold to the Seattle Public Aquarium.

B. In October, 1965, Merrill Spencer and Edward F. Griffin caught a 13 foot 6 inch female named Shamu weighing 2,400 pounds and estimated to be 4 1/2 years old. Sea World contracted to exhibit her seven weeks later. She was flown to San Diego aboard a chartered plane, riding in a specially designed sling in a metal frame. The plane's cabin temperature was kept at 41 degrees fahrenheit, and Shamu was wrapped in wet sheets and ice cubes. She was out of the water a total of 10 1/2 hours with no ill effects. Formal training began December 27, 1967, after she had learned to take food from the hand of a trainer. Within two months she was performing before the public in regular shows.

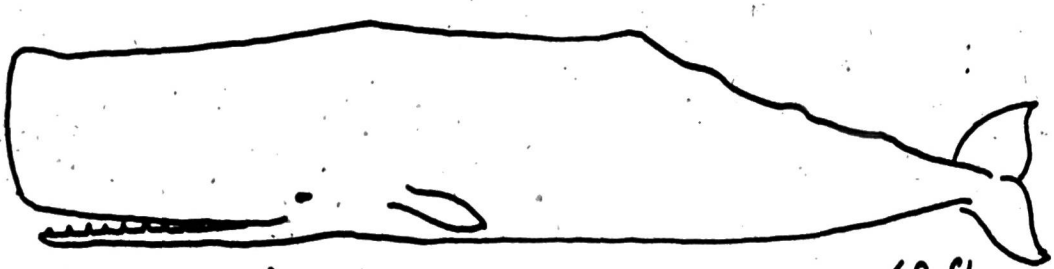
TOOTHED WHALES (Odontoceti)

Have teeth for capturing food, which is nof chewed but swallowed whole

Have a single blowhole

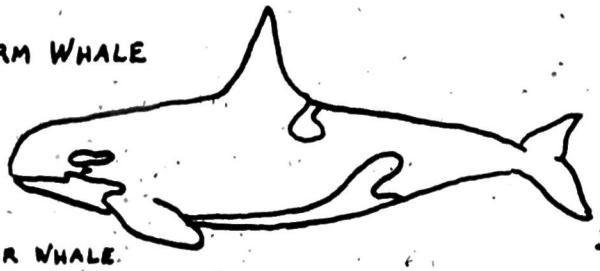
Social animals generally traveling in pods or herds

Thought to communicate with a variety of high frequency, short range sounds



60 ft.

SPERM WHALE



30 ft.

KILLER WHALE

18 ft.

BELUGA WHALE

BOTTLENOSE DOLPHIN 12 ft.

7 ft.

WHITE SIDED DOLPHIN

KILLER WHALES

INTELLIGENT HUNTERS OF THE SEA

Found in all oceans of the world, the strikingly marked black and white killer whale has no natural enemies. Capable of swimming at speeds of up to 30 mph, the powerful rhythmic beat of their movements sends walruses, seals and sea lions streaking towards land, and alerts other whales to gather together to protect their young.

Equipped with a mouthful of sharp, interlocking teeth, killer whales have earned their fearful reputation by their efficient hunting methods Although a relatively small whale (under 30 feet), they hunt together in a cooperative group effort to herd and encircle their prey, in the same way that dolphin herd schools of fish. A large part of the killer whale's diet is fish, but they also prey upon other marine mammals and birds. Like other predators, they play an important role in their environment by weeding out the sickly and weak.

Sociable animals, they generally travel in family groups. Like the dolphin, they are able to communicate with each other with squeaks, whistles and clicking sounds, and are quick to come to the assistance of a wounded or ailing companion.

In oceanariums, killer whales display a considerable intelligence, are quick to learn trained behaviors, and are gentle and cooperative with their trainers.

BELUGA WHALES.

GENTLE, WHITE WHALES OF THE ARCTIC

Distinguished from other whales by their white coloration, belugas blend well against the ice floes of the arctic waters where they live. The name beluga comes from the Russian word "belli", meaning white. Although young belugas are dark gray until about 2 years of age, they become gradually lighter until they reach maturity at 5-6 years and are snowy white.

A slow swimmer, belugas feed mainly in shallow coastal waters, catching bottom fish with their teeth, or sucking in small cuttlefish, shrimp and worms through their flexible lips. Their chief enemy is the fast swimming killer whale, which preys on young belugas.

A unique characteristic of the beluga is that its neck bones are not fused together, as in other whales and dolphins, so it is able to turn its head from side to side.

Belugas are also noted for their sound production. One of the most vocal of whales, they have been called "sea canaries" for the complex variety of trills, chirps, whistles, clicks and moans produced within the nasal passages of the blowhole. Some of these sounds are forms of communication, while others are used for echo locating under ice floes and in murky waters. The distinctive bulge on their forehead, called the melon, is filled with a fine oil and acts as an acoustical lens in transmitting these sounds. Able to change the shape of the melon by muscular action, it is thought they can focus the direction of these transmissions.

BOTTLENOSE DOLPHINS

PLAYFUL, SOCIAL ANIMALS WHICH HELP EACH-OTHER

Best known of the dolphin family, bottlenose dolphins are frequently seen in oceanariums, where their friendly nature, and their naturally playful and inquisitive behavior, delights visitors. Their graceful swimming ability, precision leaps and natural tendancy to push or toss objects, combined with a keen intelligence, make them ideal animals to train. Often observed inventing new forms of play activities, they are quick to investigate new objects and often use them to entice other dolphins to play.

Social animals, dolphins travel together in family groups, called pods. Should any member of the group be endangered, or become ill or injured, the other members are quick to lend assistance, and will physically support an ailing companion at the surface for days.

When feeding, several groups of dolphins may work together in a mutual effort to herd and encircle schools of fish, or to drive them into shallow water. While some of the dolphins keep the fish contained, others take turns feeding. Fish are caught by using their sharp, pointed teeth, but are swallowed whole.

Dolphins, because of their intelligence, ability to communicate with a wide variety of sounds, and their use of echo location to navigate and locate food, continue to be subjects of intensive scientific inquiry

WHITE SIDED DOLPHINS

STREAMLINED ACROBATS TRAVEL IN SCHOOLS OF HUNDREDS

Smaller and shorter beaked than the bottlenose dolphin, the Pacific white-sided dolphins are distinctive for their striking markings and acrobatic abilities. Leaping high in the air, they land on their sides or back with a loud smack. they even somersault in mid-air - the only species to do so in the wild.

Found in offshore waters along the Pacific coast, from the tip of Baja California to Alaska, they frequently travel in huge combined herds with the common dolphin. Easily spotted from a considerable distance, fisherman keep a watch for signs of these splashing herds, since they help locate schools of fish.

Like the common dolphin, they are vigorous swimmers, streaking along through the water in a powerful up and down undulating motion. This mode of swimming, shared with other dolphins and whales, brings the nostrils (or blowhole), located on the top of the head, above the surface for breathing, without interrupting the forward motion of the animals---- a useful adaptation when pursuing the fast swimming fish and squid on which they feed.

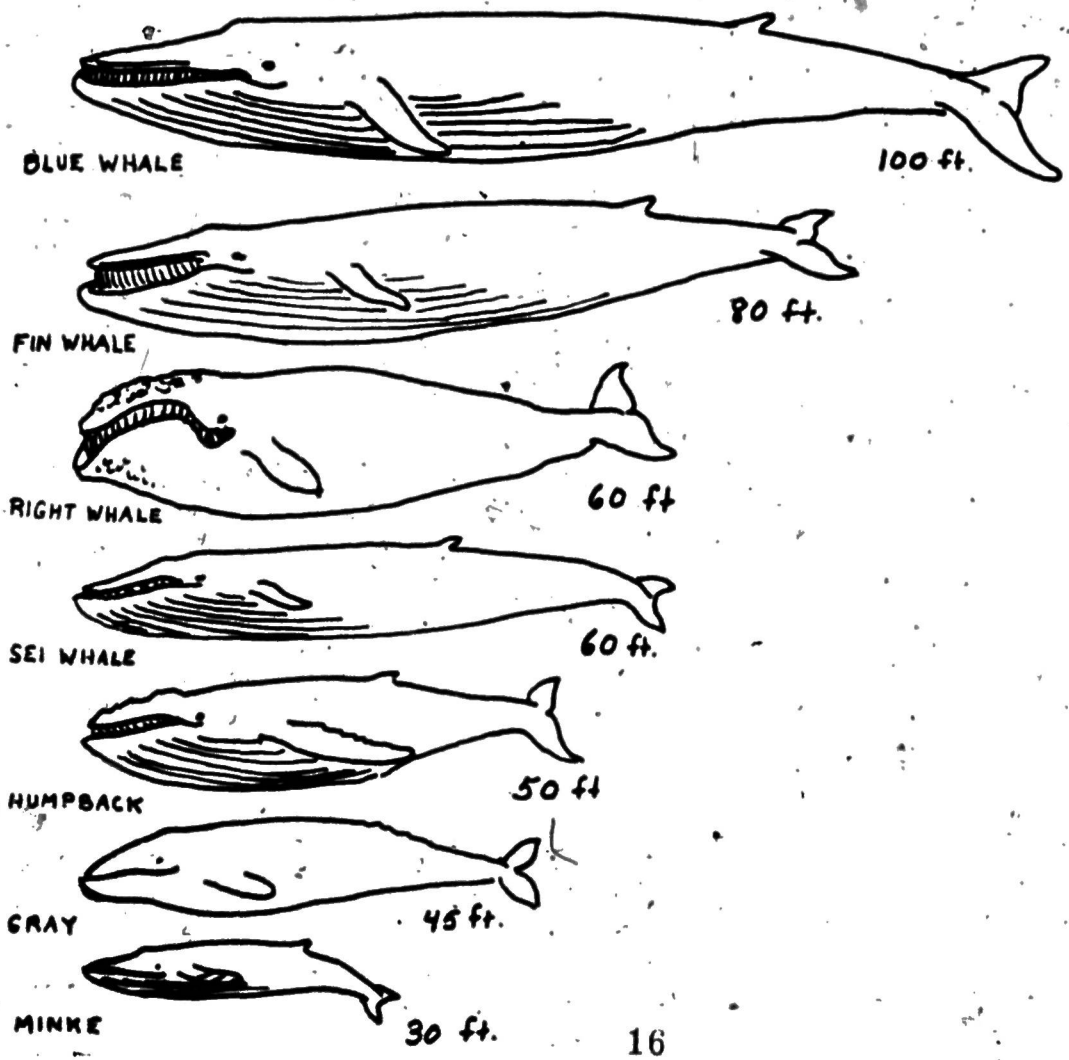
BALEEN WHALES (Mysticeti)

Strain food from ocean waters through the comblike baleen plates, which hang down from the upper jaw

Have two blowholes

Generally travel alone or with young

Thought to communicate with extremely low freqeency, long range sounds



BLUE WHALES

THE LARGEST ANIMALS EVER TO LIVE ON EARTH

More than three times heavier than the largest dinosaurs, the giant blue whale weighs over 130 tons and may exceed 100 feet in length. The huge heart alone weighs a half a ton, and pumps more than 2,000 gallons of blood through the mammoth body.

To provide food for its enormous bulk, this largest of all animals feeds on some of the smallest but most numerous forms of ocean life - the plankton (in particular a tiny two inch long, shrimplike plankton, called krill).

Traveling alone or in pairs, the blue whale migrates each year to antartic waters to feed on the abundant summer growths of krill. Consuming atleast four tons of these tiny creatures each day, the whales must filter thousands of gallons of water through their strainerlike baleen plates. These enormous quantities of food, converted into blubber, serve as a stored energy supply to sustain the whales during the eight month journey to and from their equatorial breeding grounds.

In the warm open oceans near the equator, the three ton calves are born. Nourished by their mother's rich milk, at a rate of 50 gallons a day, the calves gain 200 pounds a day. By the end of seven months of nursing, the calves weigh over 20 tons and are ready to start south with their now thin mothers, for the polar feeding grounds.

RORQUAL WHALES

MODERN STREAMLINED GIANTS OF THE OPEN OCEANS

The most modern and recently evolved family of whales, the rorquals can be recognized by their streamlined shapes, long pleatlike grooves running along their undersurface and a small dorsal fin set well back along the spine. This family includes the giant blue whale (100 feet) and fin whale (80 feet), the mid-size sei and humpback whales (60 feet), and the smaller minke (30 feet).

With the exception of the humpback whale, which often travels near continental coasts, the rorquals are strong, fast swimmers inhabiting the open oceans. Until the 1890's, they had little to fear from the early whalers in slow sailing vessels. However, as the numbers of more easily captured gray, right and humpback whales declined, and power driven ships and explosive harpoons came into use, whalers began hunting the swift rorquals. The advent of sea-going factory ships made even more intensive whaling feasible.

By the 1960's, the numbers of large rorquals (the giant blue and fin whales) were being seriously depleted. The smaller sei and minke whales are now being taken in larger numbers. The International Whaling Commission, established to control the numbers of whales taken by those countries still actively whaling, has set yearly quotas, but the whale populations in the world's oceans continues to decline. In 1974, a ten year moratorium, or suspension, of all whaling activities was suggested, but was not adopted.

RIGHT WHALES

AN ENDANGERED GIANT, JUST "RIGHT" FOR HUNTING

Once abundant, the several species of right whales were almost hunted to extinction. Their large size (50-60 feet) and slow swimming speed, as well as their thick layer of blubber - which yielded hundreds of barrels of oil and kept their bodies afloat after harpooning - made them the "right" whale to hunt in the early whaling days, before power driven boats.

Right whales have a thick, blunt shape, no dorsal fin and a mammoth head. The huge lower jaw is sharply arched, and unlike other baleen whales, is not grooved along the undersurface. The upper jaw holds ponderous 10-14 foot long plates of fringed, comblike, horny material, which are used to strain food from the water.

The head of the Arctic right whale or bowhead, one-third the total length of the body, is smooth and free of barnacles. The black right whale, found in both Atlantic and Pacific waters, has a distinctive calluslike growth, called a "bonnet", on its head which is heavily encrusted with hitchhiking whale lice.

At the turn of the century, after petroleum oil replaced the use of whale oil, right whales continued to be taken for their long baleen plates, which provided the "whalebone" stays for fashionable lady's corsets. Protected by international law since 1920, right whale populations in all oceans is now estimated to be less than 1,000 individuals.

HUMPBACK WHALES

"THE MOST GAMESOME AND LIGHTHEARTED OF ALL WHALES"
Herman Melville

In an exuberant display of energy, humpback whales will burst from the water, twist sideways and fall backwards in an explosion of white spray. This behavior is called breaching, and humpbacks will sometimes breach as many as 20 times in a row. These spectacular leaping displays can often be observed from land, since the humpback's yearly migrations, to inshore breeding grounds, bring them close to the continental coasts.

A middle size (50 feet) member of the streamlined rorqual family of baleen whales, humpback whales have the characteristic grooves along the underside and a small dorsal fin, but are distinguished by extremely long and narrow, wing-like flippers with white scalloped edges.

Recent studies have revealed the humpback whale to be a gentle, family-oriented animal, with the ability to communicate with songs. With the use of hydrophones and sensitive recording equipment, man has recently been able to record these complex sequences of sounds, produced within the nasal passages of the whales' blowholes. Some of these songs last more than half an hour. The meaning of these sounds, many of which are repeated at intervals, is not known, but it is thought that different songs are used to convey different kinds of information.

GRAY WHALES

LIVING FOSSILS YEARLY PASS CALIFORNIA'S COAST

Gray whales, their 40 foot long gray bodies encrusted with barnacles, are a familiar sight to residents of California's coast. Having no dorsal fin, they are easily recognized by the distinctive row of bumps studding the lower part of their backs.

Gray whales are the sole survivors of a family of whales, which lived in the world's oceans 30 million years ago. These primitive remnants of an earlier time are still dependent on shallow nearshore waters to find food and to bear their young.

The summer months are spent off the coasts of Siberia and Kamchatka in the Bering Sea and nearby Arctic Ocean. Using their pointed snouts, the gray whales plow up the bottom sediments to stir up the crustaceans and clams living there. These are then filtered from the turbid water through the fringed baleen plates hanging from the whale's upper jaw.

With the coming of fall, the grays cross the Pacific to California and then, hugging the coast, travel southward to bear their young in the shallow warm water lagoons along Baja California's pacific coast. On this yearly trip, from northern feeding grounds to southern breeding grounds, they will travel more than 10,000 miles - one of the longest migrations undertaken by any mammal.

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What is Behavior?

Behavior is the way an animal acts. Through evolution, marine mammals have become physically equipped to live in the water. They have also evolved ways of acting (behaving), which make it possible for them to survive in their environment, to find food and to reproduce.

INNATE BEHAVIOR — Built in Capabilities

Some behaviors are so essential for an animals survival that they have become inborn (innate or instinctive).

EXAMPLES:

Voluntary breathing—marine mammals hold their breath instinctively and must make a conscious effort to breathe.

Homing instinct—some marine mammals return each year, often across thousands of miles of open ocean, to breed in the same place; thus insuring they will meet others of their own kind, in a place proven favorable for raising their young.

Nursing instinct. Courting and mating instincts. Territorial defending behavior by males. Swimming ability in whales and dolphins which are born in the water, etc.

LEARNED BEHAVIOR—Trial and Error and Practice

Although physically equipped to live in the water, many behaviors necessary for survival must be learned; either from the mother or through play behavior with other juveniles during the time of growth and development.

EXAMPLES:

Swimming in pinnipeds (seals and sea lions) that are born on the land and must learn to swim.

Development of swimming skills and food catching behaviors.

Recognition of areas where food is to be found.

Recognition of communication signals within the group—danger warnings, food location signals, threatening or mating gestures and sounds, etc.

This learning process is through a trial and error system of imitating and experimenting, and then practicing. Whether or not a behavior is repeated depends on how rewarding it is. Marine mammals are extremely curious and find new objects and experiences challenging. Often they will initiate a new behavior as a game. If they are rewarded by catching something to eat, or with the pleasurable experience of having others join in the game, the behavior will be repeated and a new behavior will be learned.

TRAINED BEHAVIOR — An Extension of Natural Learning

In his natural environment, there is neither the necessity nor the opportunity for a marine mammal to learn many of the complex behaviors performed by trained animals. However, within the limits of its physical and mental capabilities, these complex new behaviors can be taught, by extending the animals natural learning processes.

The same principles of reinforcement of behavior, through positive rewards, or not reinforcing by the absence of rewards, is the key to behavioral training used by Sea World trainers in training marine mammals.

Transparency 1 Harbor Seal and California Sea Lion

May be used to illustrate discussions and activities concerning the physical and behavioral differences and similarities of seals and sea lions.

Suggested Activities:

1. Physical Similarities and Differences —"Pin-the-Seal."

Students can place markers on the various parts of the body to show parts used for:

a. Locomotion on land:
   Seal—back and front flippers.
   Sea lion—body and front flippers.

b. Locomotion in water:
   Seal—back flippers.
   Sea lion—front flippers.

c. Steering in water:
   Seal—front flippers.
   Sea lion—back flippers.

d. "Seeing" underwater:
   Seal and *sea lion*—ears and eyes.

e. Touching and identifying objects:
   Seals and *sea lions*—whiskers.

f. Holding objects:
   Seal—mouth.
   Sea lion—mouth and front flippers.

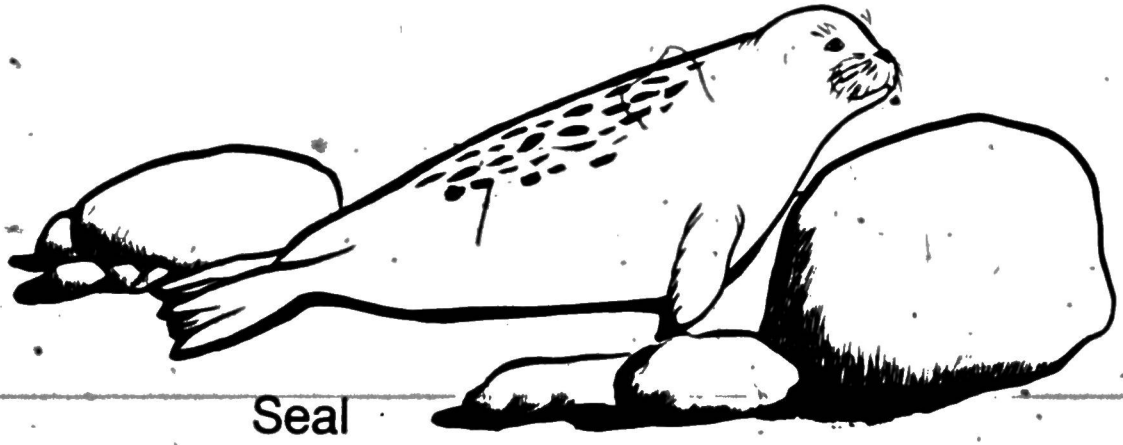
2. Behavioral Characteristics —"Let's Pretend."

Students act out behaviors such as:

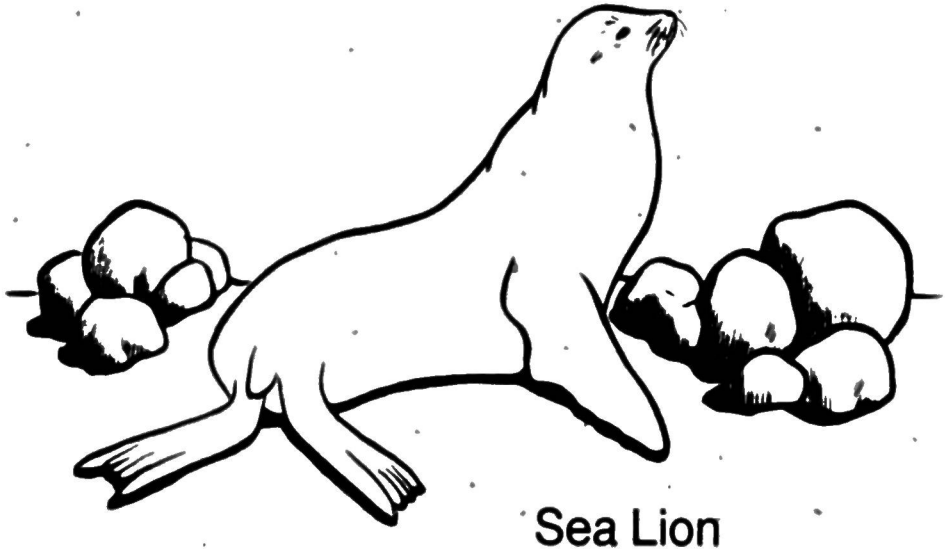
a. Locomotion on land:
   Seals—"hump" along like caterpillars pushing with their front flippers.
   Sea lions—"gallop" on all four flippers, flippers rotate under body (*seals* cannot do this).

b. Play behavior:
   Seals—alert "sitting-up" position (like prairie dogs).
   Sea lions—toss and catch objects in mouth or jousting matches, chest to chest with neck weaving, nipping and barking.

c. Sunning behavior:
   Seals—separate and watchful.
   Sea lions—all piled together etc.



Seal



Sea Lion

Transparency 1

Transparency 2 Marine Mammals: Dolphin, Sea Lion and Seal

May be used to illustrate discussions and activities concerning differences, similarities and swimming methods of three marine mammals: the dolphin, seal and sea lion.

Suggested activities:

1. Physical Characteristics and Swimming Methods:

a. Locomotion in water:

Seal: sculls hind flippers back and forth, uses front flippers for steering.

Sea lion: uses front flippers in up and down "flying" motion, back flippers for steering.

Dolphin: tail fluke used for propulsion in up and down stroke, side flippers for steering.

b. Seeing: (in clear, or dark or murky water) use eyes and ears.

Seals and *dolphins* have ear holes (more streamlined).

Sea lions have ear flaps.

c. Breathing:

Seals and *sea lions:* have nostrils (closed underwater).

Dolphins: have blowhole (closed underwater) on top of head so do not have to lift head to breathe.

d. Feeling:

Seals and *sea lions:* use whiskers. *Dolphins:* transmitted through skin.

e. Hand bones:

Dolphins, seals and *sea lions:* in front flippers.

f. Foot bones:

Seals and *sea lions:* in back flippers. *Dolphins:* None. Have developed tail.

2. Art Expression Activities:

Use as illustrations after visit to Sea World, where students have had opportunity to watch marine mammals move in water. Encourage students to *express* the *feeling* of graceful movement, curving lines, smoothness etc., of their bodies *through* the *tactile medias* of:

a. Clay modeling b. Finger painting

3. Language Expression Activities:

Draw *word pictures* of the children's *impressions* by making word lists of adjectives for each animal. For example: describing the physical lines, movement and play behavior:

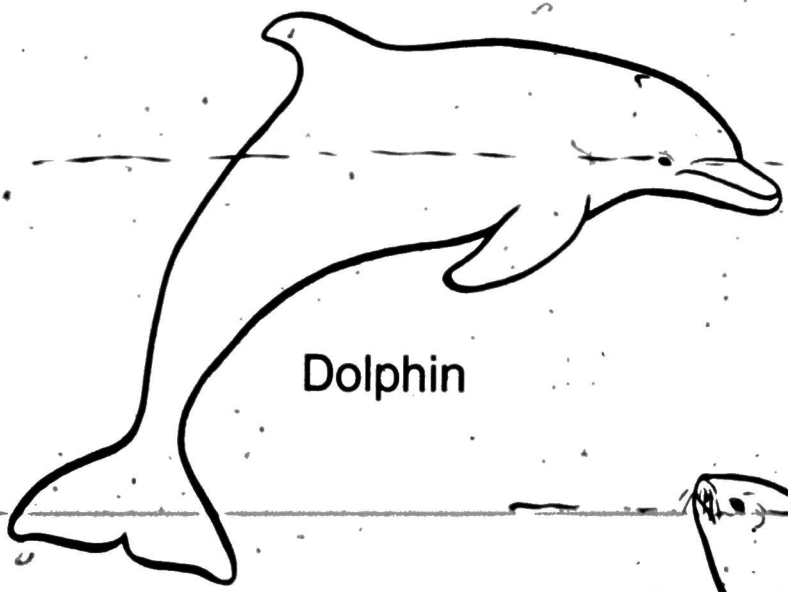
Dolphin: Graceful, streamlined, fast-leaping, agile, etc.

Seal: Slow, smooth, sleek, round, watchful, etc.

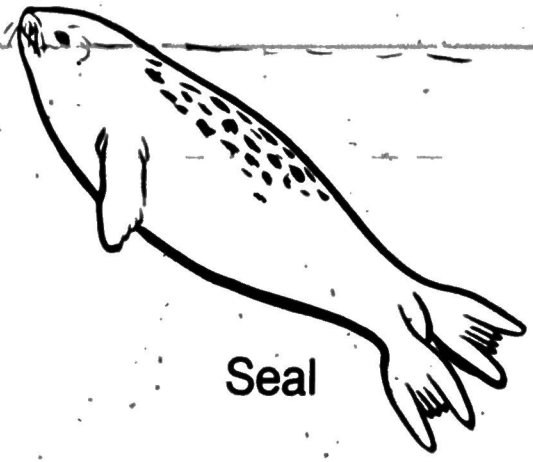
Sea lion: Flexible, rubbery, quick, playful, quarrelsome, etc.

Killer whale: Big, strong, fast, splashy, etc.

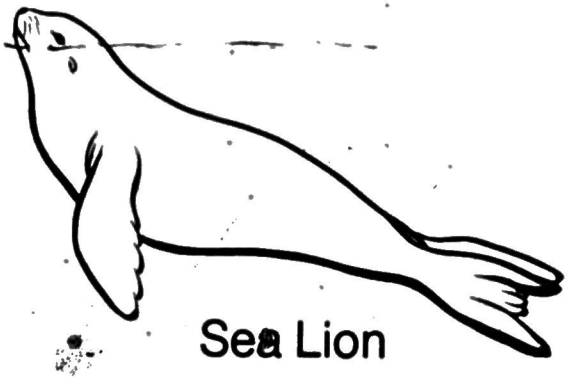
Elephant seal: Big, slow, noisy, wiggly, etc.



Dolphin



Seal



Sea Lion

Transparency 2

Suggested Extra Reading

MARINE MAMMALS

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Harrison, Richard and King, Judith, *Marine Mammals*. London: Hutchinson and Company, Ltd., 1965.

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Jacobs, Jr., Lou, *SHAMU, the Killer Whale*. New York: Bobbs-Merrill Company, Inc., 1968. (J)

Wheat, Collins, *Whales and Dolphins*. New York: Golden Press, 1963. (J)

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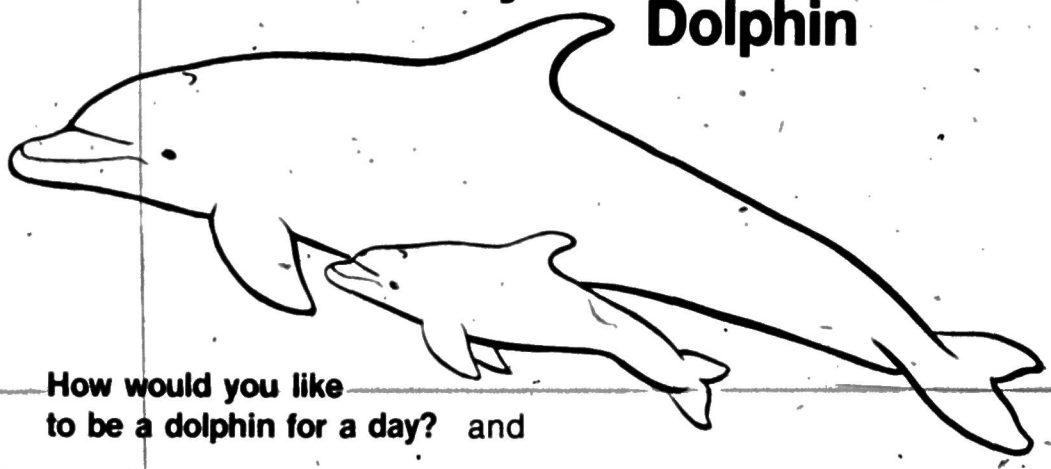
The friendly playful Dolphin



How would you like to be a dolphin for a day? and

Play keep-a-way and chase with a piece of seaweed?
Round-up a school of fish?
Go surfing on a racing wave?

or

Play follow-the-leader and leaping games?

DOLPHINS LEARN WHILE PLAYING

A young dolphin must learn to be a good swimmer. He learns by practicing, and for a dolphin, learning can be hours of fun.

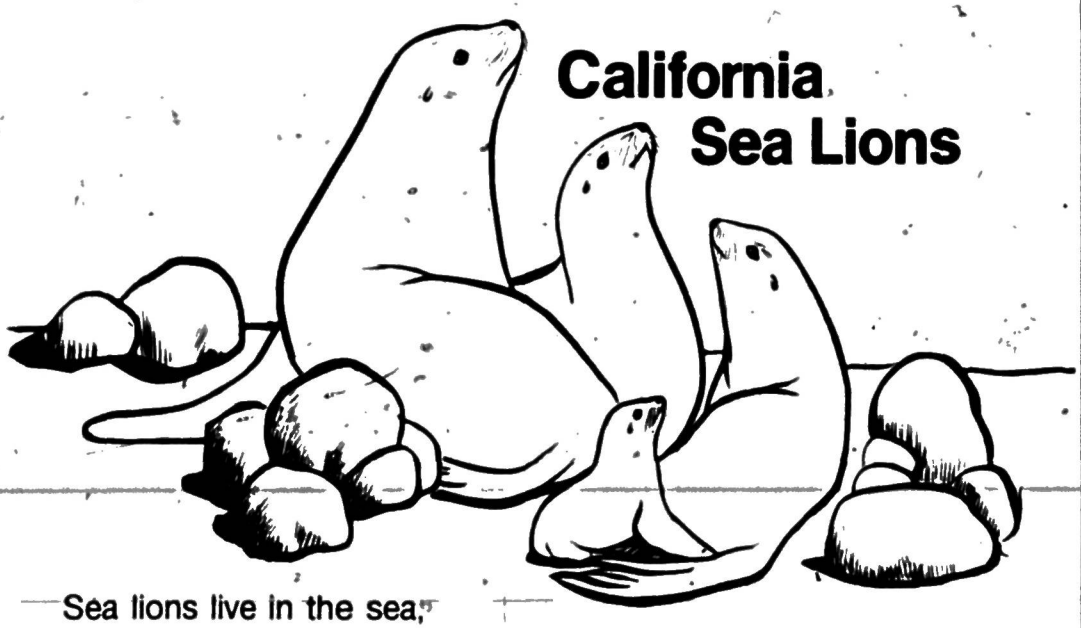
LIKES NEW GAMES

Dolphins are quite smart and very curious. They like to discover new things to play with. A slow, swimming sea turtle is great fun to push with your snout. Even human children make nice playmates—until they get out of the water and go away!

HELP EACH OTHER

Dolphins not only play together, they also stay together. When there is danger or when another dolphin is sick or hurt, they will help protect it, and will even hold it up at the surface so it can breathe.

California Sea Lions



Sea lions live in the sea,
but they are born on the land.

BEGIN LEARNING ON LAND

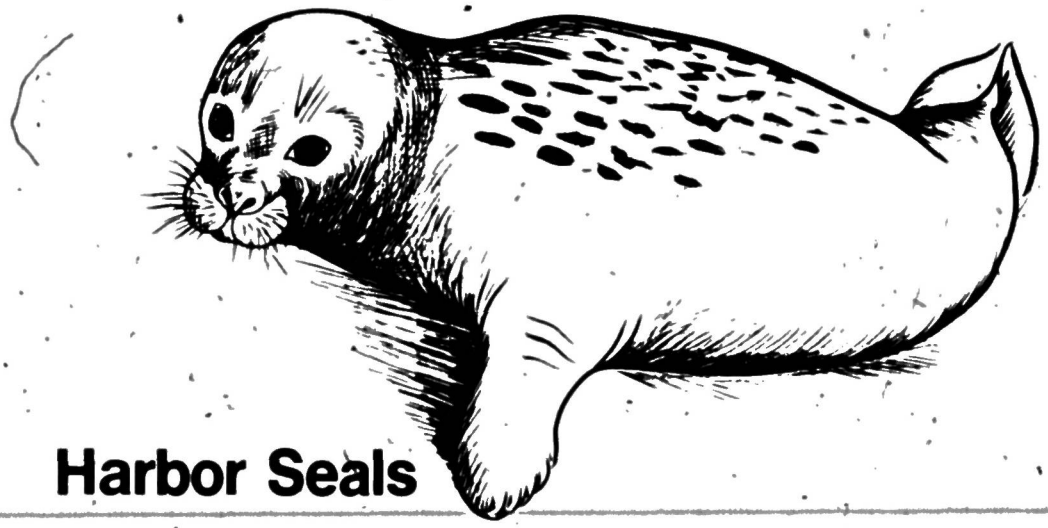
While their mothers are at sea feeding, the sea lion pups "gallop" around the rocks on their four flippers and use their whiskers to help search for objects to play with. They also like to toss pebbles up into the air and catch them in their mouths.

MUST LEARN TO SWIM

The mothers must teach the sea lion pups how to swim and dive for food. They learn very quickly. Sea lions like to chase each other and do somersaults. They even like to chase their own bubbles. Soon they can swim as well as their mothers, and can go to sea with them to find food.

LIKE TO SUN BATHE

Sea lions like to group together on the rocks to sun bathe. Sometimes the little California sea lions even use the big elephant seals for mattresses.



Harbor Seals

SEALS BORN ON LAND

A seal pup is a marine mammal which begins its life on the land. Round and plump, with short front flippers, it "humps" along slowly like a caterpillar.

AT HOME IN THE WATER

When a seal pup is a few weeks old, the mother will begin to teach it to swim and dive.

In the water, the seal's body is shaped just right for swimming and it can swim very fast. It uses its back flippers to speed through the water.

Seals can make long deep dives when looking for food, and their big brown eyes help them to see in the deep dark waters.

SEALS ARE VERY WATCHFUL

Seals spend a great deal of time sitting up in the water and looking around. When they come out of the water to lie in the sun, they do not pile together in a big friendly heap like the sea lions. Instead, they keep a watchful lookout from the rocks by the water's edge.

Elephant Seals

The elephant seal gets its name from its large nose and great size. It may grow to be 20 feet long and weigh as much as 8,000 pounds (or as much as two large station wagons).

SLOW AND CLUMSY ON LAND

Because of their great size, elephant seals are very slow and clumsy on land, and can not be as easily trained as their lively cousins the sea lions.

GOOD SWIMMERS AND DIVERS

In the water, elephant seals are strong swimmers. They can stay underwater for 10 minutes or longer while resting on the bottom, and can dive 1,000 feet or deeper to look for food.

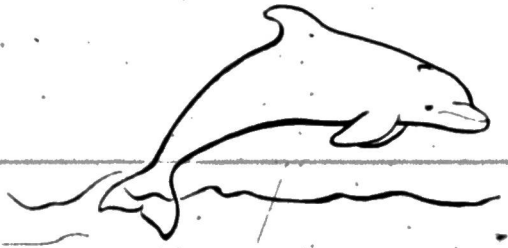
LIKE TO SLEEP CLOSE TOGETHER

Elephant seals like to spend hours all bunched together in the sun. They are very sound sleepers and don't seem to mind if sea lions pile on top of them.

YES SIGNAL=WHISTLE
REWARD=FISH
NO SIGNAL=TAP ON PIPE

How to train a Dolphin to jump over a pole

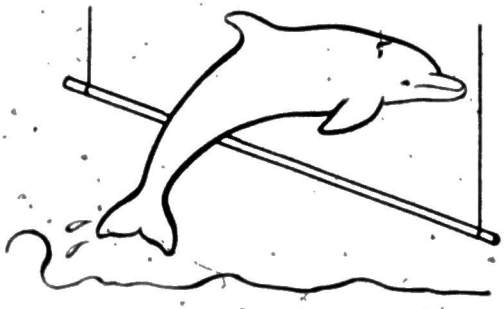
1. The trainer sees the dolphin jump, he blows the whistle (yes signal) and gives it a fish reward.



YES

REWARD

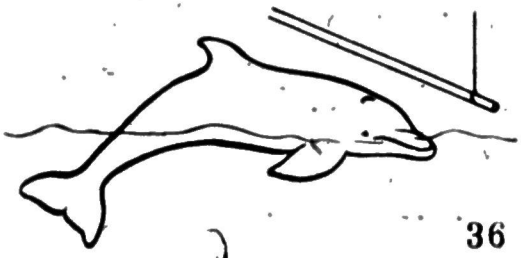
2. The dolphin is no longer rewarded for just jumping, now must jump over a pole to hear the whistle and get a fish reward.

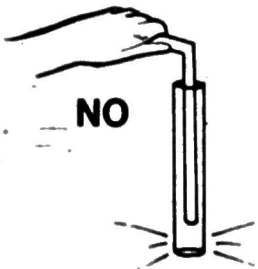


YES

REWARD

3. If the dolphin doesn't jump over the pole, the trainer taps on a metal pipe (no signal) and does not give it a fish reward.





NO

What have you learned about Animal Training?

If you were a trainer at Sea World, how would you train a dolphin to jump over a pole?

What would you use for a yes signal?
What would you give the dolphin as a reward for jumping?
What would you do if the dolphin did not jump over the pole?

How would you train a sea lion to walk over and touch your hand?

What would you use for a yes signal?
What would you give the sea lion when he touched your hand?
What would you do if the sea lion did not touch your hand?

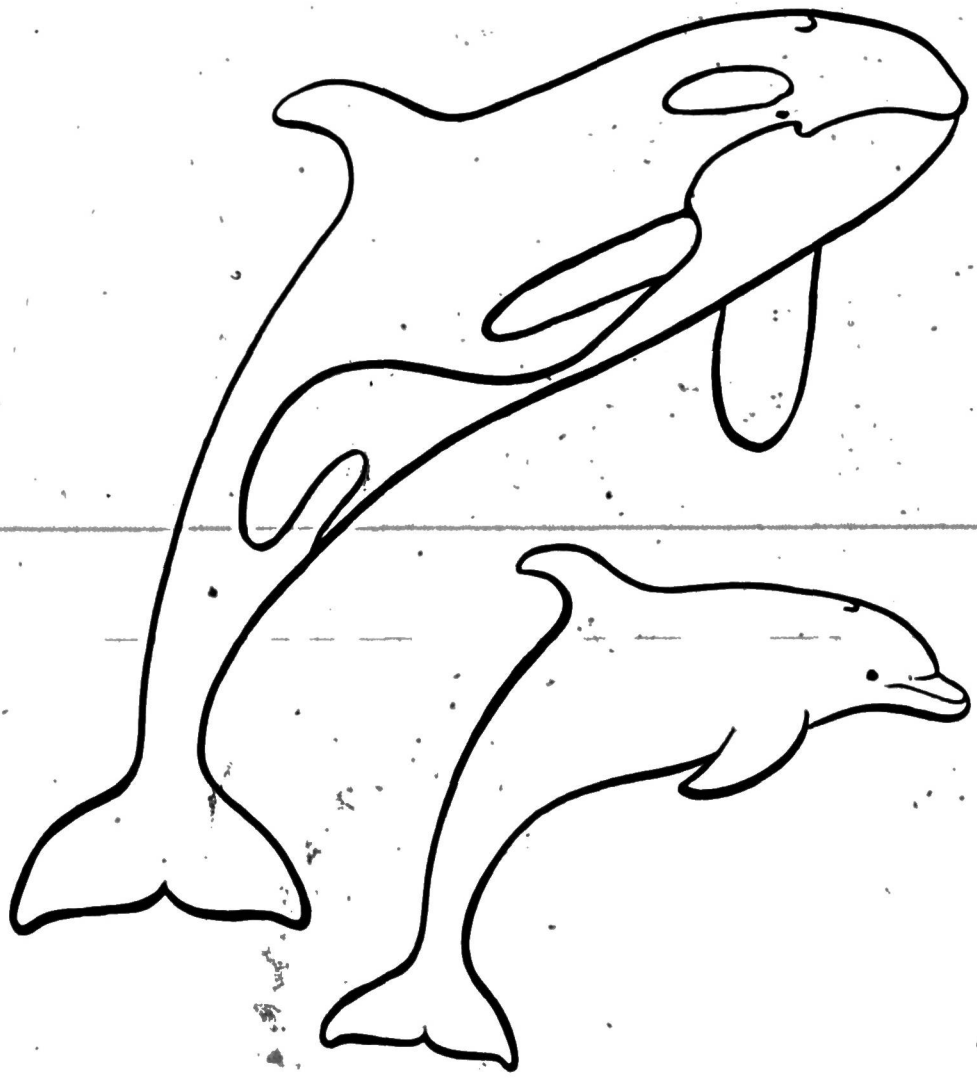
If you wanted to train your dog to come to you?

What could you use for a yes signal?
What could you give him as a reward?
What could you do if he didn't come?

Things to remember:

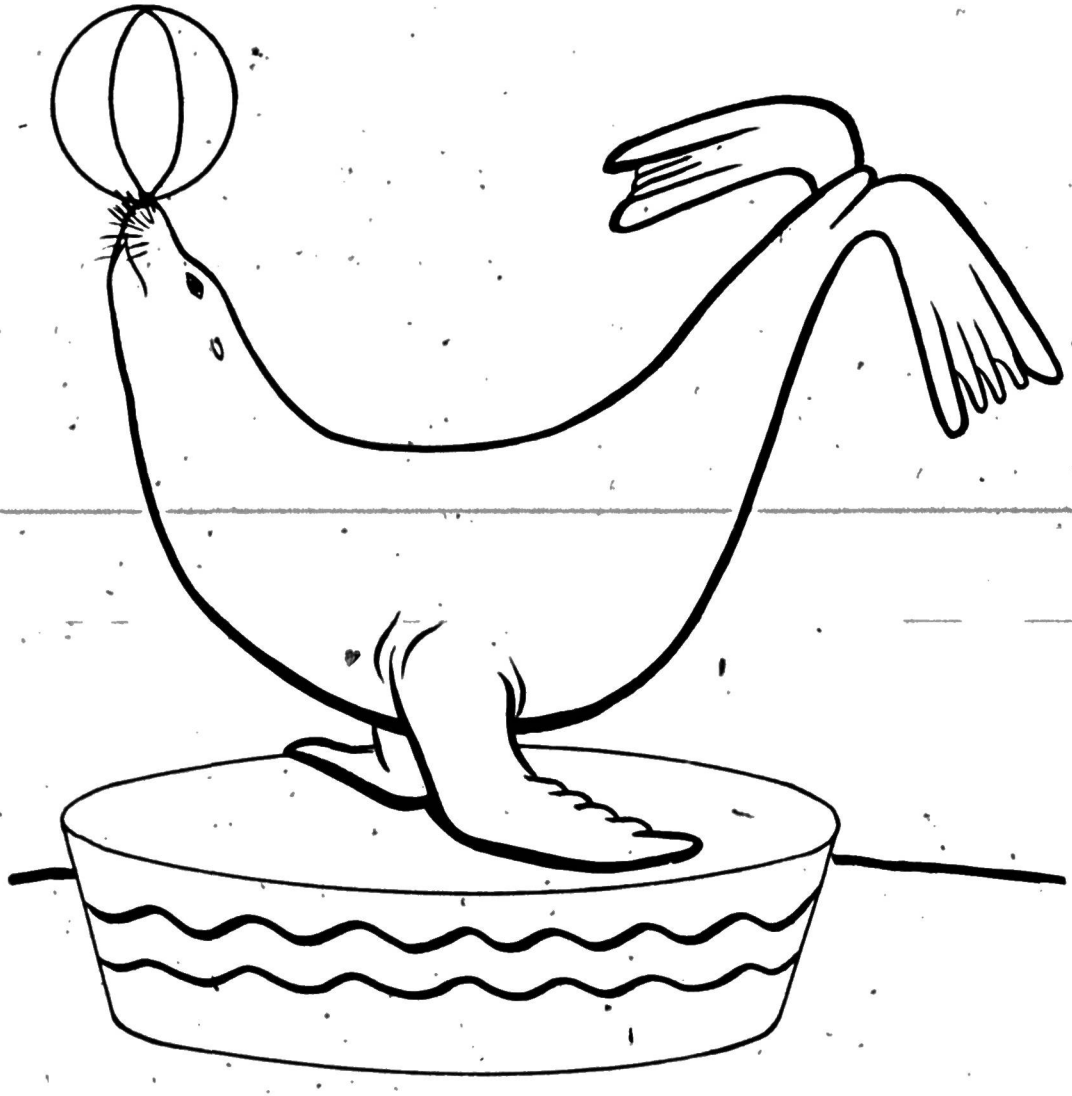
An animal trainer must be very patient.
The animals are trained with rewards, not punishment.

Draw a picture of you training a sea lion or your dog.



Killer whales and dolphins can be trained to do many difficult and exciting tricks (trained behaviors). With the use of their strong tails, they can make high leaps out of the water and can be trained to "tail walk."

What other trained behaviors did you see the killer whales and the dolphins do at Sea World, which made use of their natural swimming and leaping abilities, and their strong tails?



Sea lions can be trained to stand and walk on their strong front flippers. They also can be trained to use their stiff whiskers to toss and catch and balance objects.

What trained behaviors did you see at Sea World that made use of the sea lions naturally strong swimming ability, and their strong front flippers?