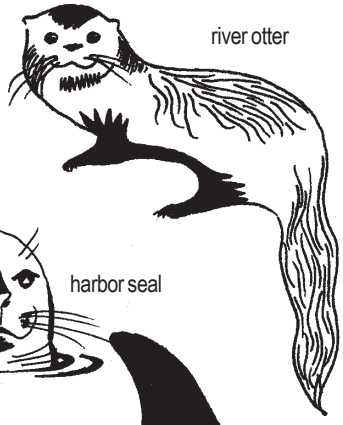
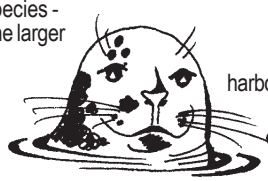
GUIDE TO THE MARINE LIFE OF PUGET SOUND AND WILLAPA BAY

MARINE MAMMALS



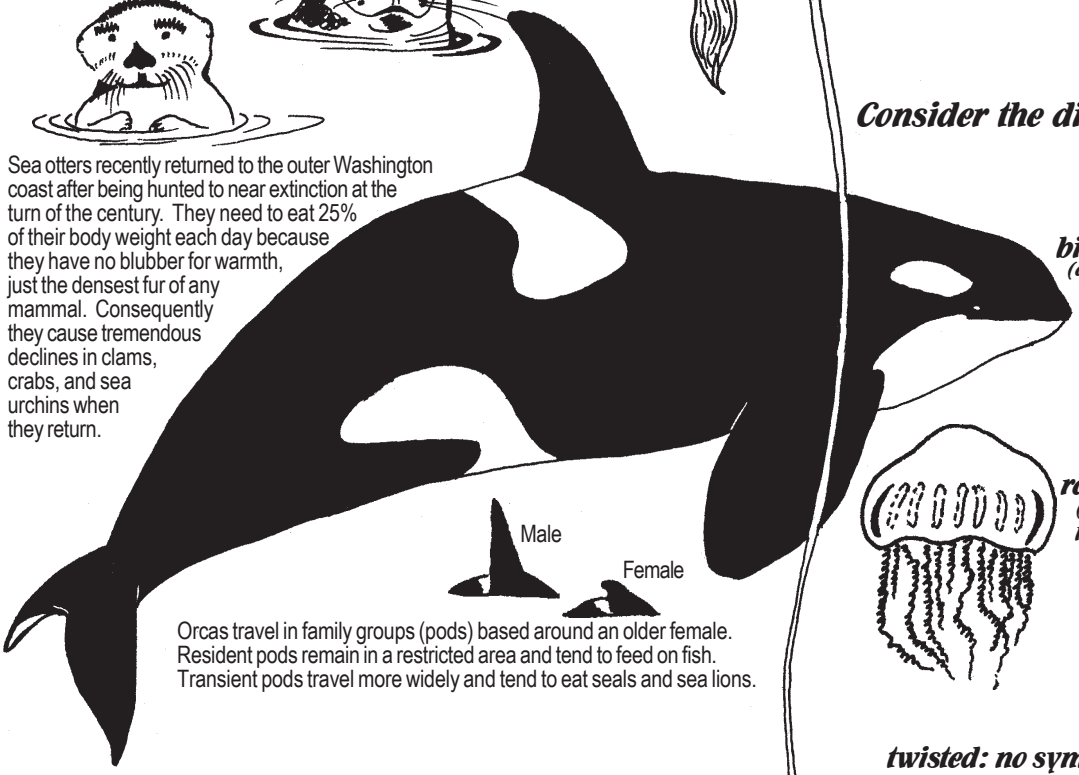
river otter

Sea lions comprise two species - the smaller California and the larger Stellar



harbor seal

Sea otters recently returned to the outer Washington coast after being hunted to near extinction at the turn of the century. They need to eat 25% of their body weight each day because they have no blubber for warmth, just the densest fur of any mammal. Consequently they cause tremendous declines in clams, crabs, and sea urchins when they return.



Male

Female

Orcas travel in family groups (pods) based around an older female. Resident pods remain in a restricted area and tend to feed on fish. Transient pods travel more widely and tend to eat seals and sea lions.

Many land mammals, including deer, bear, and elk periodically swim between the mainland and islands. Hummingbirds buzz across the water at a furious pace!

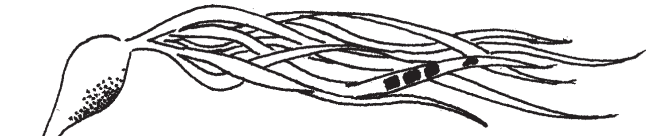
Grey

Humpback

Whales were hunted extensively in the 1700's and 1800's throughout the Pacific Northwest for their meat and oil. At some stations, up to 500 whales were harvested annually, taking just 15 years to deplete local whale populations. Today grey whales have recovered along the west coast.

mink

Vertebrates such as fish and marine mammals are part of one marine phylum. All told, there are 28 phyla in the ocean, of which 13 are found only there (endemic). In contrast, freshwater systems have no endemic phyla, and terrestrial systems have only one.

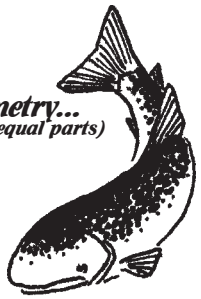


Kelps are the 'trees' of the ocean. Like all seaweeds, they are rootless, obtaining nutrients directly from the water. The bull kelp, pictured here, grows from a tiny spore up to 20 meters in one year, then reproduces (look for dark patches on the fronts at the water's surface) and dies.

Much of the ocean's production is carried out by 'plants' you can't even see; phytoplankton drifting in an oceanic soup. Warm water and nutrients allow plankton 'blooms', which turn the water cloudy by midsummer each year.

Consider the diversity of body plans...

bilateral symmetry...
(divisible into two equal parts)



radial symmetry...
(divisible into many equal parts - like a pie!)

pentameric symmetry...
(divisible into five equal parts)

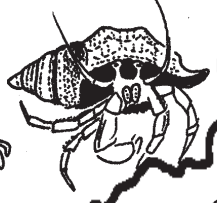
twisted: no symmetry!

Bivalves...

The original recyclers:
Hermit crabs use old shells for protection. The Pacific Northwest has remarkable hermit crab diversity - over 35 species.

snails...

and chitons are all molluscs.

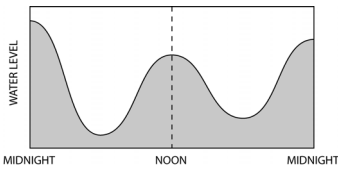


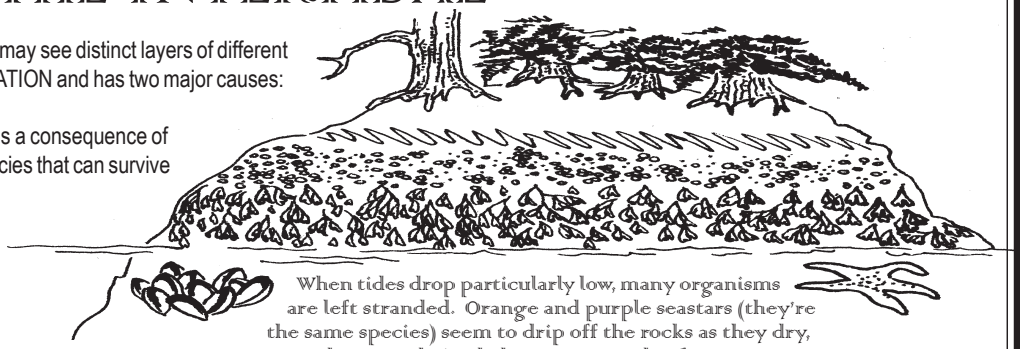
In the ocean, a snail without a shell is called a nudibranch.

PATTERNS IN THE INTERTIDAL

If you squint your eyes and look towards shore, you may see distinct layers of different creatures. This pattern is called INTERTIDAL ZONATION and has two major causes:

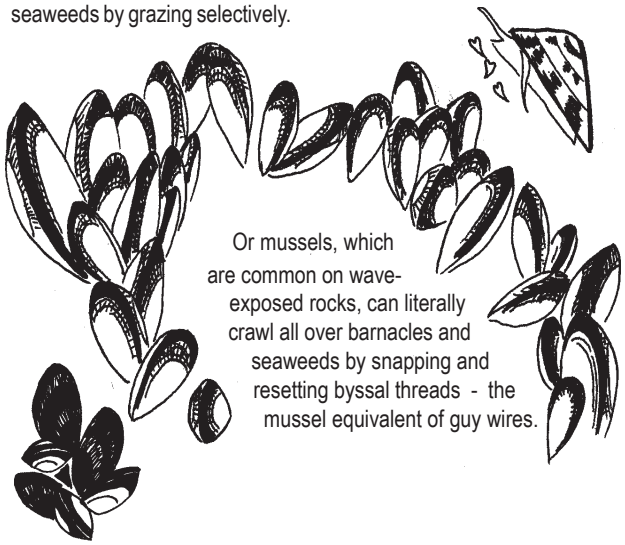
1. TIDES: Ocean water rises and falls twice daily as a consequence of gravitational pulls from the sun and moon. Only species that can survive drying out live in the upper intertidal.





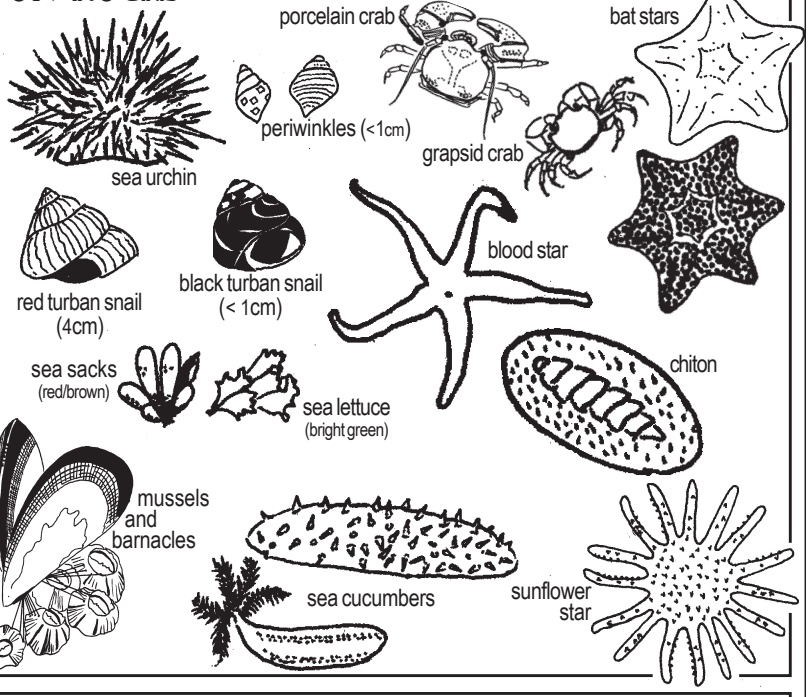
When tides drop particularly low, many organisms are left stranded. Orange and purple seastars (they're the same species) seem to drip off the rocks as they dry, because their 'skeletons' are made of water.

2. NEIGHBORS: Some species are relegated to a particular tide level because of their interactions with other species. Where they persist may be the only place they are not eaten by predators or beaten by competitors. For instance cap-shaped limpets can change the species composition of seaweeds by grazing selectively.



Or mussels, which are common on wave-exposed rocks, can literally crawl all over barnacles and seaweeds by snapping and resetting byssal threads - the mussel equivalent of guy wires.

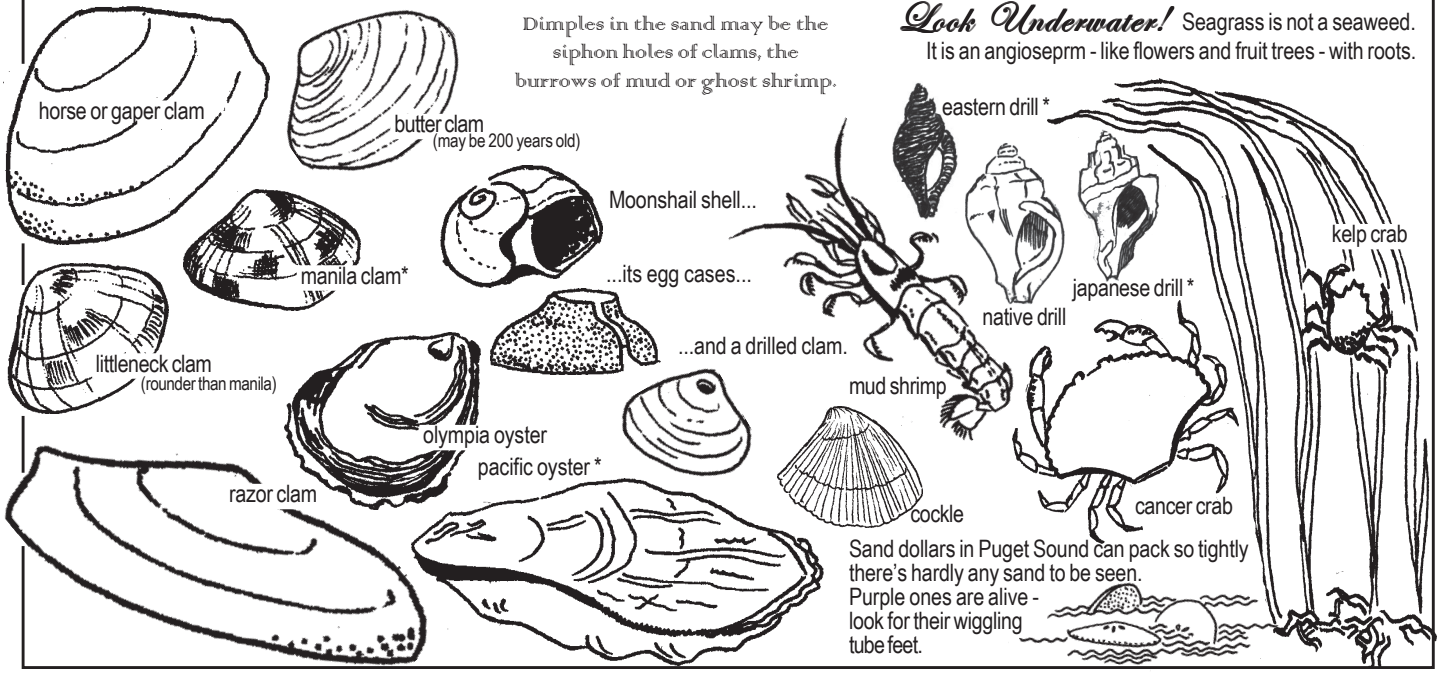
ON ROCKS



ON BEACHES & MUDFLATS

Dimples in the sand may be the siphon holes of clams, the burrows of mud or ghost shrimp.

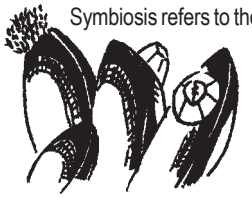
Look Underwater! Seagrass is not a seaweed. It is an angiosperm - like flowers and fruit trees - with roots.



Sand dollars in Puget Sound can pack so tightly there's hardly any sand to be seen. Purple ones are alive - look for their wiggling tube feet.

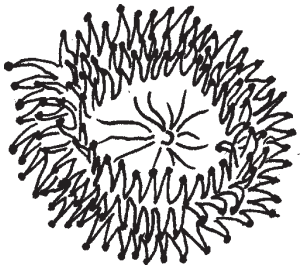
SEASIDE SYMBIOSIS

Symbiosis refers to the intimate coexistence of 2 species living together.

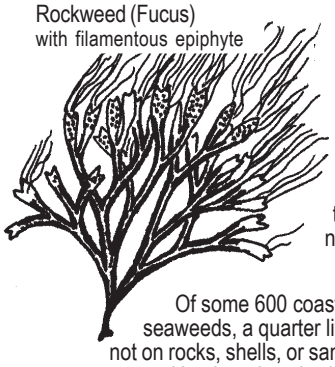


Plants or animals living on host animals (like seaweeds or barnacles on mussels) are *'epizootic'*. When plants or animals live on plants, they are called *'epiphytes'*.

Sometimes symbiosis is helpful (mutualistic). For instance, sea anemones are animals, but many species have tissues packed with tiny plant cells, which can turn the anemone green! Photosynthesis by these cells provides the anemone with energy, while some of the nutrients gathered by the anemone during its feeding get shunted to the symbiotic plants.



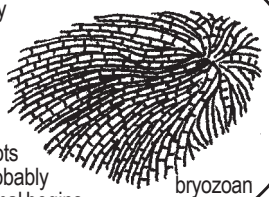
Rockweed (Fucus)
with filamentous epiphyte



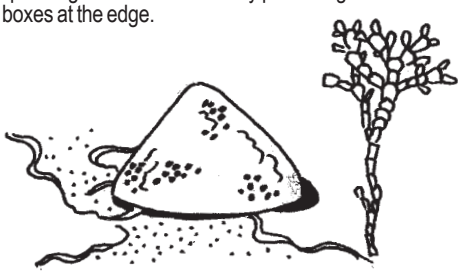
In other cases, symbiosis may be detrimental. Many red seaweeds have parasites - a different seaweed species that does not photosynthesize itself, but instead takes energy and nutrients from its host.

Of some 600 coastal Pacific Northwest seaweeds, a quarter live only on other plants, not on rocks, shells, or sand. Most of these epiphytes are not parasitic, since they do photosynthesize, but they can nevertheless damage their host by intercepting light or nutrients.

Plants and animals can be deceptive in the ocean. Plants, after all, come not just in standard green shades but range all the way from pink to black. Animals may be brainless, spineless, and immobile (think sponges). Furthermore, many are not properly 'individuals' at all, but rather consist of lots of identical units. Cloning is already common in the sea! For instance, light spots on kelp fronds are probably bryozoans. This animal begins life as a microscopic hat-shaped larva with a fringe of tentacles for feeding and swimming. Upon settling on kelp, it cements itself down, metamorphoses into a tube of tentacles extending from a small calcified box, and begins expanding outward in a circle by producing more identical boxes at the edge.



bryozoan



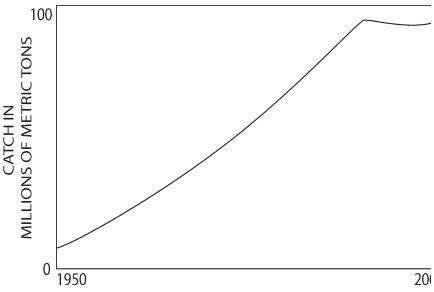
The shell of the dunce - or mitre-cap limpet is often covered by the same seaweed that it eats. There are numerous species of these 'coralline' seaweeds: some are crusts, other stand upright, all embed- calcium carbonate in their pink tissue.

OCEANIC RISKS

El Nino: Every few years oceanic currents shift and bring warm water to the Pacific Northwest, complete with ocean sunfish, tuna and great white sharks. This warm water carries few nutrients, which can be hard on local fish, invertebrates, and seaweeds.

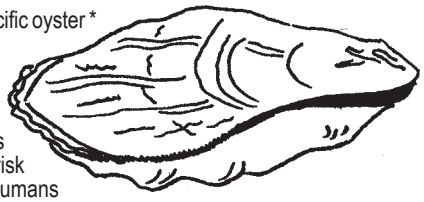
Pollution/ Oil Spills:
The worst spill on this coast involved 36,000 metric tons of crude oil from the Exxon Valdez tanker into Prince William Sound, Alaska in 1989. Over 30,000 oiled birds and 1,000 oiled mammals were dead or dying when collected afterwards. Several parts of Puget Sound are polluted from industrial and agricultural runoff of chemicals and pesticides. Subsequent recovery of rehabilitated beaches, estuaries, and waterways stands as testimony to the system's resilience but should not make us complacent about the effects of chronic or more frequent pollution.

Overfishing:
World harvest peaked in 1989, despite a continuing increase in aquaculture. A quarter of what is caught is discarded dead as 'bycatch'. The UN consider 70% of the world's fisheries to be overexploited and to require management for conservation.

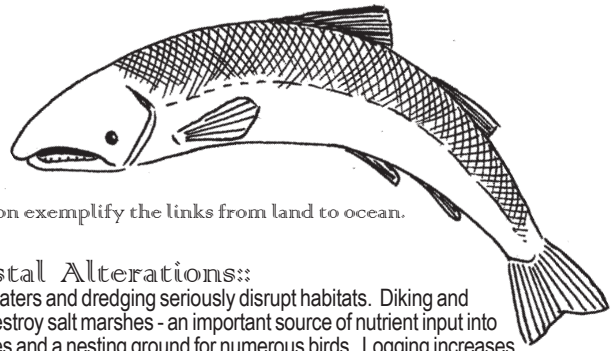


Sculpin and Gunnels:
these intertidal fish are harvested by herons, not humans!

pacific oyster *



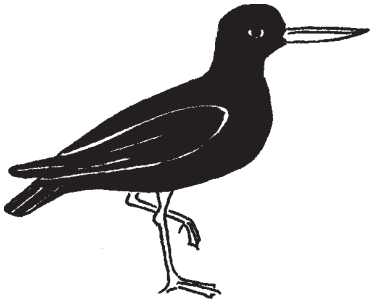
Introduced Species:
Species on previous pages with an asterisk were introduced by humans to Puget Sound and Willapa Bay as food (oysters), as hitchhikers with oysters (manila clam, japanese and eastern drill) or in ballast water of ships (varnish clam). While some introduced species may be beneficial, all tend to homogenize the earth.



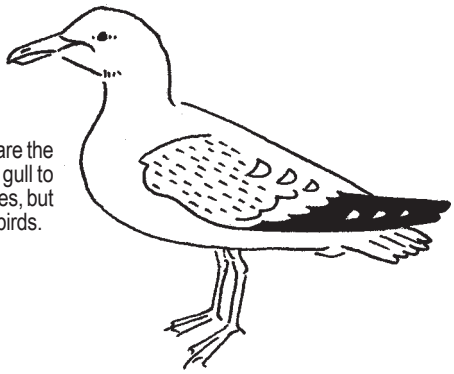
Salmon exemplify the links from land to ocean.

Coastal Alterations::
Breakwaters and dredging seriously disrupt habitats. Diking and filling destroy salt marshes - an important source of nutrient input into estuaries and a nesting ground for numerous birds. Logging increases runoff, choking waterways, increasing sedimentation and raising nutrient levels which can cause toxic phytoplankton blooms. Diverting freshwater for urban and agricultural use can change the salinity of estuaries, which are crucial nursery areas for many fish and shellfish, and can block the return of anadromous fish such as salmon.

MARINE BIRDS



Black oystercatchers eat few oysters. Instead, they flip limpets off rocks with their bright red bills. Females lay 3-4 cryptic eggs in a small depression in the sand or on a cliff.



Most of the gulls here are glaucous-winged gulls, but dark wingtips are the sign of western gulls or a hybrid combination. It takes 3 years for a gull to grow out of its brown juvenile plumage. Gulls flourish on landfill wastes, but also eat fish, intertidal molluscs and crustaceans, and eggs of other birds.

Look for white dots in the tops of trees - they could be bald eagles. Although eagles have a ferocious reputation, much of their food is scavenged. With outstretched claws, they may swoop from their perch to the water when they sight fish, but their grabs are usually unsucessful.

Seaducks include...

goldeneyes,

harlequins,

and scoters.

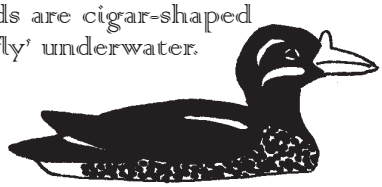
They all dive to forage on nearshore invertebrates.

The male common merganser looks mostly white from a distance. Females have red heads.

Cormorants nest on ledges of cliffs and in caves. In many areas of North America, their populations seem to be increasing explosively.

These four alcids are cigar-shaped birds that 'fly' underwater.

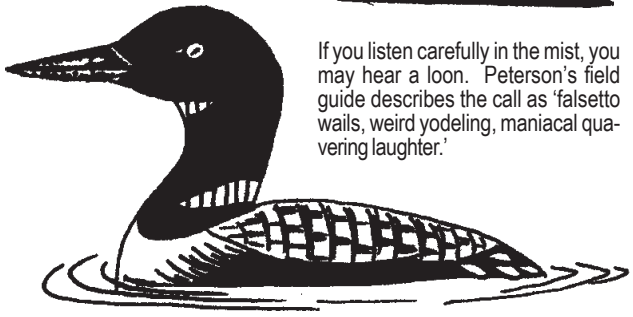
Marbled murrelets are tiny, and often in pairs.



Rhinoceras auklet

Common murres are dark above and light below, to blend with sea or sky, depending on your perspective.

Pigeon guillemots have red legs and mouths.



If you listen carefully in the mist, you may hear a loon. Peterson's field guide describes the call as 'falsetto wails, weird yodeling, maniacal quavering laughter.'