FEEDING HABITS OF THE BLACK OYSTER-CATCHER

By J. DAN WEBSTER

The best method of determining the food of the Black Oyster-catcher (*Haematopus bachmani*) is to collect the shells scattered around young birds which are being fed by the parents. However, care must be taken to collect only those shells that are fresh, because shells cleaned by the oyster-catchers in previous years, or by ravens, crows, or gulls, are often present, sometimes in large numbers in crevices and crannies of the rock.

The data here presented are based on shells collected on various small islands in Sitka Sound, southeastern Alaska, in 1940. A few of the shells, mostly *Mytilus edulis*, were collected from spots where birds had been observed foraging, immediately after they had left.

Mytilus edulis. Common Mussel. Found on mud flats in sheltered bays; most abundant in the mid-tidal region. Forty-five shells of this mussel opened by oyster-catchers averaged 41.1 mm. in length by 19.3 mm. in width. The largest shell opened was 57 mm. by 23 mm.; the smallest shell opened was 27 mm. by 14 mm. Eighty-five living mussels chosen at random from a scalp averaged 45.6 mm. in length. This shows, as Dewar (1915) found with the English Oyster-catcher, that the Black Oyster-catcher has a decided preference for medium-sized mussels.

Mytilus californianus. California Mussel. Abundant on exposed, rocky shores in the upper and mid-tidal regions. Most mussels are attached ventrally; the oyster-catcher fractures one valve in the opening process, and eats the flesh immediately or gives it to the young bird without the shell. But, thirty-two nearly perfect shells were found high on the rocks, near young birds. Evidently these had been pulled loose from the rocks without breakage because they had been attached dorsally, thus weakly (see p. 177). These shells averaged 40.2 mm. by 20.3 mm.; the largest was 60 mm. by 33 mm., the smallest 19 by 10.

Acmaea scutum. Shield Limpet. Found on sheltered and semi-exposed rocky shores in the mid-tidal horizon. Particularly common on the inner, semi-exposed side of such islands as Black Oyster-catchers choose for nesting sites. One hundred and eleven shells averaged 26.1 mm. by 19.8 mm.; the largest was 43 by 37, the smallest 12 by 9.

Dewar (1913:53) found 85 per cent of the limpet shells cleaned by oyster-catchers "whole or only slightly chipped, with the abrasion or fracture always at one edge only, being of any shape." Three hundred and fifty-six shells of this and the following two species of limpets were examined by the writer, who found 38 per cent fractured, 37 per cent slightly chipped, and 25 per cent perfect.

Acmaea digitalis. Ribbed Limpet. Found on exposed, rocky shores, in the mid-tidal horizon, and usually behind boulders or ledges where it does not receive the full force of the surf. Two hundred and twenty-eight shells averaged 25.2 mm. by 18.2 mm.; the largest was 40 by 29, the smallest 13 by 8.

Acmaea mitra. Dunce Cap Limpet. Found on exposed, rocky shores at the low tide horizon, much below the four preceding species. Twenty-four shells averaged 23.2 mm. by 18.8 mm.; the largest was 28 by 24, the smallest 18 by 15.

Katherina tunicata. Chiton. Found on exposed, rocky shores, where it is uncovered only on the lower low tides. Forty-three shells averaged 41.9 mm. by 22.9 mm.; the largest was 73 by 38, the smallest 28 by 15.

Mitella polymerus. Pacific Goose Barnacle. Found on exposed, rocky shores in the upper and mid-tidal regions. Two shells opened by oyster-catchers measured, respectively, 24 mm. by 20 mm., and 25 mm. by 25 mm. All barnacles are opened where found, because they cannot be detached from the rock; if the flesh is fed to the young it is carried to them without the shell.

Nereis sp. Two or three small worms, probably *Nereis vexillosa*, were found among the shells surrounding two chicks that were less than a week old. Older chicks did not refuse the worms, but ate them whole.

It is likely that other shellfish are occasionally eaten by the Black Oyster-catcher. Young abalones are mentioned by Grinnell, Bryant and Storer (1918: 501); near Sitka, small abalones (*Haliotis kamchatkensis*) are common and form a staple food for crows and ravens, yet so far as could be found, they never were eaten by oyster-catchers. A few

shells of keyhole limpets (*Diadora aspera*) were found which may have been cleaned by oyster-catchers. Observations indicated that large individuals of the common barnacle (*Balanus glandula*) were occasionally eaten.

Stomach analyses.—Twelve Black Oyster-catchers, ten adults and two juveniles, were taken in 1940, near Sitka, and their stomach contents noted, as follows:

Cornell Univ. Coll. No.	Date	Stomach Contents
7371	March 5	1.7 gr. of shell, including 13 entire small limpet shells.
7372	April 1	.1 gr. of shell, including 2 entire small limpet shells; flesh of 4 large limpets.
7714	May 2	.7 gr. of shell, including 3 entire small limpet shells; flesh of 2 large limpets.
7892	May 23	.1 gr. of shell; flesh of 21 large goose barnacles; flesh of 26 large limpets; 1 small *Nereis*.
8045	May 23	.3 gr. of shell, including 1 entire small mussel shell; flesh of 10 large limpets; flesh of 1 barnacle; flesh of 4 mussels.
8047	July 12	.3 gr. of shell; hard parts of 2 *Nereis*.
8046	July 12	.4 gr. of shell and gravel; hard parts of 1 *Nereis*.
7889	September 4	1.0 gr. of shell.
7890	September 5	1.0 gr. of shell, including 4 entire small limpet shells; flesh of 4 chitons; flesh of 2 large limpets; flesh of 10 goose barnacles; flesh of 6 mussels.
7891	September 5	1.5 gr. of shell; flesh of 1 large limpet; flesh of 20 goose barnacles.
7888	September 5	.3 gr. of shell.

In the foregoing table, "small" limpets were less than 12 mm. long, save for one which was 15 mm. long. These, of course, like the single "small" mussel found, which was 7 mm. long, had been swallowed whole because too small to permit removal of the flesh from the shell. The shell particles that were found had evidently been chipped from the shell during removal operation and had been swallowed accidentally with the flesh. These shells are ejected by the birds every day or two in pellets, which may be found as small mounds of tiny shell fragments on any oyster-catcher roosting spot.

In an attempt to determine the rapidity of digestion in the oyster-catcher, a caged juvenal bird was fed thirty-five large mussels. Two hours later the bird was killed and the stomach examined. Only a few tough adductor muscles remained undigested in the stomach. The rest of the material was in a semi-liquid state in the intestine, or had already been absorbed.

Feeding methods.—The observations of J. M. Dewar on the feeding habits of oyster-catchers in England are in quality far above those of any other observer. The present writer has endeavored to check and to supplement Dewar's observations and to apply them to the Pacific Coast species.

A mussel's attitude of rest is one in which the valves are separated slightly, because of the tension of the elastic ligament. Dryness would shrivel the internal structures were the mussel at rest in other than moist or submerged situations. Most of the mussels on the banks are attached securely by strands emerging ventrally through the byssal fissure, and the dorsal border is uppermost. In a few instances, however, the mussel is attached dorsally or vertically.

"The oyster-catchers must search for the gaping shells, and the birds are to be seen at these times walking sedately over the banks, their heads directed forwards, and their bills in a position ready to strike. Each Mussell is approached in the line of its major axis, and is submitted to careful inspection" (Dewar, 1908: 204). If the mussel

meets with approval, the oyster-catcher strikes a sharp blow with the point of the bill on the dorsal border, oblique to the long axis of the mussel. This depresses the valve if the mussel is relaxed, thus forming an abnormal gap which will admit the tip of the bill. The mussel has a tendency to close its valves in the abnormal position, thus permitting entrance of the bill an indefinite number of times (see Dewar, 1913: 42). If this blow is unsuccessful, which often is the case, the bird continues the search for other game. When the preliminary blow is successful, the bill is pushed down into the mussel by a number of jerks with great rapidity and force, until the deepest part of the bill lies lengthwise between the margins of the valves. Next the mussel is opened by one or more of several methods.

The simplest method is sidewise leverage, gained by tipping the head or by shaking, which is sometimes successful. Often these actions are followed or replaced by circular leverage; the bird walks around the shell to the left through a quarter circle, or rotates the head on a vertical axis. Another common method consists of lowering the head almost to the ground on one side of the mussel, thus causing the point of the bill inside the shell to press the opposite valve from its fellow. This is often repeated in case of failure (Dewar, 1908:205). Success results, in most cases, in a fracture of the left valve, beginning at the point where pressure is applied.

The oyster-catcher always walks around or lowers its head to its own left side (Dewar, 1908: 205; checked by personal observation of the species under consideration), and this results in asymmetry of the adult skull in the maxillary and lacrimal regions (Stresemann, 1929: 438-439; equally true in *H. bachmani*).

The ventral byssal fissure is the one weak point in the mussel's armor, and the rare shells so placed that this is uppermost are eagerly sought for by the oyster-catchers. Such mussels form the exception to the rule that dried and therefore tightly closed shells are left alone. The valves are opened by one of the methods already described, but usually without fracture. These mussels are sometimes detached after opening and carried to some more convenient location for removal of the meat. Many mussels are located by probing in the mud, where they may be buried as much as an inch and a half; those opened are usually ventral border up.

Removal of the body of the mussel from its shell is a rapid process. This was performed efficiently even by a young oyster-catcher on the day of capture, when it was thirty days old. The greater part of the mollusk forms but a few mouthfuls; large pieces are torn away and transferred to a point within reach of the tongue by jerks of the head. The bird then walks around to the other end for work there, or if the shell is detached, sometimes turns it around. To scrape out the mantle, the bill is used like scissors. It is laid flat on the inner surface of the shell and pushed forward as the points snip away the adherent flesh. After the end is reached, the bill is returned and cuts a parallel furrow, and this is continued until the shell is clean. "This skilful procedure is carried through rapidly without pause, and often without moving the shell. It is seldom seen towards the end of the feeding periods, and at these times shells are to be found in which portions of the mantle remain" (Dewar, 1908: 211). By the ordinary methods, 200 mussels per hour is the maximum speed for opening and eating by a single oyster-catcher.

The writer agrees with Dewar (1913) that the oyster-catcher does not pry limpets from the rock with its bill laid flat. The bird lowers its head, points its bill toward the ground at a low angle, and delivers a sharp push or chipping stroke on the edge of the limpet shell. Small limpets are thus toppled over. (This first stroke has evidently not been observed or not been appreciated by several other ornithologists.) With larger

shells this preliminary stroke which has weakened the limpet's grip and, perhaps, chipped the shell, is followed by firm and laborious pushing, assisted by lateral bill swaying, or a to and fro rotation of the bill. If this does not complete detachment, the bill is forced under the shell, which is levered up and flies free suddenly. The limpet is then seized and carried to a niche or crevice in the rock, where it is detached from the shell by chipping strokes, and then swallowed in one piece. Detachment is often completed by the bird shaking its bill and flicking the shell off its body as the head is raised. Small limpets are thus disposed of in four seconds from the time they were first sighted.

Why does not the oyster-catcher pry with his bill flat? Because he has not the strength to pry off tenacious limpets which have been warned. Wet, relaxed mollusks are the ones sought; these are slightly raised and permit the first tap to give additional advantage or complete victory to the bird (see Dewar, 1913).

In attacking chitons, the first stroke is delivered as on a limpet, but unless the chiton is small and therefore toppled over at once, further quick work is necessary. One corner of the flexible, leathery shell is detached by pushing with the tip of the bill, thus breaking the vacuum set up by the muscular foot of the mollusk. Usually, then, the bill is slipped under, flat side against the rock, and the animal is *cut* from the rock by sawing strokes of the bill. Removal of the animal from the shell is a laborious process, which sometimes takes as much as three or four minutes when a tight-fitting niche for the shell cannot be found. The chiton is much more firmly attached to its shell than a limpet, but contains more food than a limpet of equal length.

The oyster-catcher approaches a barnacle when it is relaxed, taps one valve as it would a mussel, then levers the valves apart by circular leverage. The body of the crustacean is pulled out in a single piece and makes just one bite for an adult oyster-catcher.

The following table represents, in summary, an estimate of the composition by bulk (in per cent) of a Black Oyster-catcher's food over the period of a year:

Acmaea digitalis	30
Mytilus edulis	20
Mitella polymerus	15
Mytilus californianus	15
Acmaea scutum	13
Katherina tunicata	5
Acmaea mitra	1
Nereis sp.	1

Distribution.—It is interesting to note the correspondence of the range of the exposed rocky-shore invertebrate association (*Mytilus californianus, Pisaster ochraceous, Mitella polymerus, Acmaea digitalis*), which extends from Point Concepcion to the western Aleutians (Ricketts and Calvin, 1939), and that of the Black Oyster-catcher. Although the quiet-water shellfish are important, in stormy weather particularly, *Mytilus californianus, Mitella polymerus* and *Acmaea digitalis* certainly form three-fifths of the food consumed by an oyster-catcher in the course of a year.

The distribution of *Haematopus bachmani* should be stated as: resident on the Pacific coast of North America from Kiska Island, in the Aleutians, east and south to Abreojos Point, on the west coast of Lower California. One record (Hanna, 1920:253), January 12, 1917, from the Pribilofs. Breeds on surf-beaten rocky islands and headlands and along the coasts of the Gulf of Georgia; in winter the birds gather into flocks, but do not wander more than thirty miles from their nesting places.

Migration of the species has never been noted, although Howell (1912:189) saw a single bird flying north on April 13, six miles off the coast of Lower California. Audubon (1839:245) in his original description, however, appended the single word, "migratory," evidently assuming that the western species had habits like those of the eastern. And Dall (1873:28; 1874:274) supported the story when he stated that the birds are summer visitors to Unalaska and the Shumagins, and arrive in the western Aleutians in May. But Dall had not resided in Alaska during the winter! The following authorities state that the Black Oyster-catcher is a permanent resident on parts of the coast about which they, as resident observers, are qualified to speak:

Grinnell (1928:100), Lower California
Grinnell, Bryant and Storer (1918:498), California
Gabrielson and Jewett (1940:237), Oregon
Bowles (1918:333), Washington
Brooks (1920:32; 1921:151), British Columbia
Willett (1921:128), Craig, southeastern Alaska
Turner (1886:151), Shumagin and Aleutian islands, Alaska

The writer can append the following pertinent records from Sitka, Alaska, in 1940: January 30, two birds at Sitka (David Webster); March 1 to September 5, from two to forty birds each day (personal observation); October 8, one bird in Jamestown Bay (Miss Georgia Conley); November 5, six birds in Jamestown Bay (Miss Ora Kukendall). Oyster-catchers have been seen near Sitka in winter for many years, but no notes were taken until 1940.

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