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Oystercatchers *Haematopus ostralegus* catching Pacific oysters *Crassostrea gigas*

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In October 2007, oystercatchers started feeding on Pacific oysters which were introduced into the Wadden Sea already around 1976. Particularly after 2000, they increased rapidly and formed reef structures. Up to now oystercatchers were unable to feed on Pacific oysters, probably because they live in large clusters and reefs and are difficult to open for them. Part of the oysters settle, however, on small substrates such as shells and remain for some time solitary. Early October hundreds of these solitary oysters were removed by waves and currents towards the high-water line. When they are long enough out of the water, they start to gape and this is the moment oystercatchers can insert their bill and remove the flesh. Oysters consumed by oystercatchers were on average 6.3 cm long and showed very little shell damage.

Key words: Bivalvia, Ostreidae, *Crassostrea gigas*, predation, oystercatchers, alien species, Wadden Sea

INTRODUCTION

Oystercatchers in the Dutch Wadden Sea decline in numbers because of a decrease in their preferred food, bivalves such as mussels and cockles, which is mainly due to fishery (Verhulst *et al*., 2004). They have learned to introduce the invasive American razor clam *Ensis directus* (Conrad, 1843), into their diet (Swennen *et al*., 1985), but up to now they have not being able to exploit another thriving introduced bivalve, the Pacific oyster *Crassostrea gigas* (Thunberg, 1793). To my surprise I observed oystercatchers feeding on these oysters recently along the Wadden Sea on Texel. I had never observed this here before although I visit this area almost daily now for 40 years.

OBSERVATIONS

Early October 2007, suddenly some oystercatchers started feeding on Pacific oysters along the Wadden Sea dike of the southern part of the island of Texel (The Netherlands). Although this introduced oyster was already present in the Wadden Sea for decades and form reefs since around 2000, Oystercatchers did not start earlier to feed on them.

The oystercatchers now proved to profit from oysters transported by waves from the reef nearby towards the high water line. This reef has grown here in the last few years. The oysters transported were mainly solitary specimens. As larvae they had settled on small shell fragments of cockles, mussels, soft clams, American razor clams, (living) periwinkles etc. Sometimes two oysters were growing together, but larger clusters were rare here among the drift. The length of the consumed oysters varied from 2.8 to 9.2 cm, the average size was 6.3 cm (fig. 1). Fig. 2 gives an idea of the form and size of the oysters consumed.

Since early October some tens of Oystercatchers were daily searching for the oysters near the high water line. I did see them walking with oysters in their beak and eating them on the beach. Footprints around the empty often vertically placed oysters on the small

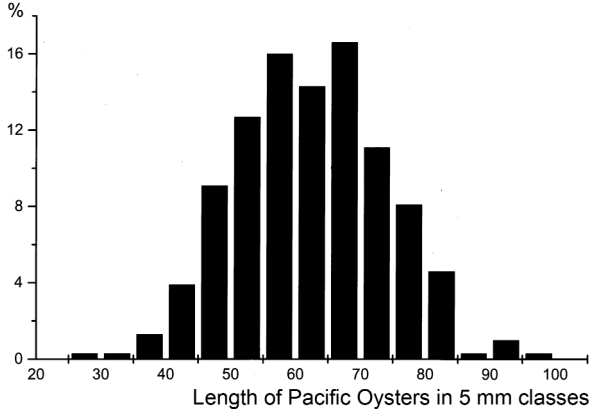

Figure **1**. Size frequency distribution of the Pacific oysters consumed by Oystercatcher, October 2007, Wadden dike, Texel, The Netherlands. n=307.

Figure **2**. A sample of the Pacific oysters consumed by the Oystercatchers on the Wadden Sea dike of Texel in October 2007, average length ca 6 cm.

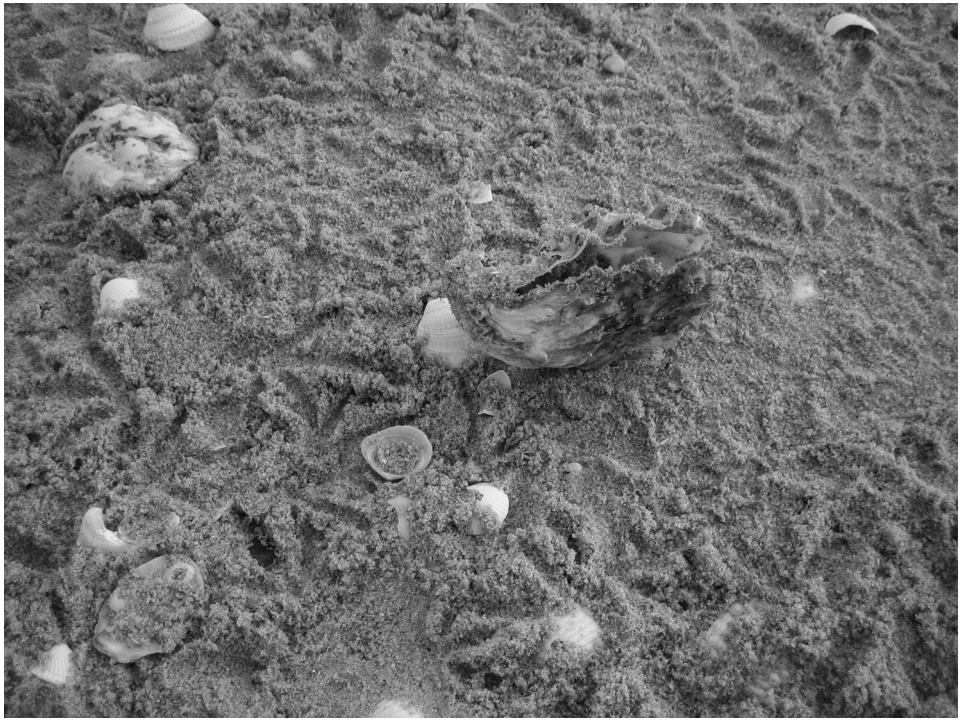

Figure **3**. Oystercatcher traces on the beach around a consumed Pacific oyster

sandy area bordering the tidal flat here at the foot of the dike indicate oystercatchers had consumed them (fig. 3). This small beach area is not flooded during normal tides. The oysters were consumed directly on this beach, or taken in the beak and brought to the waterline nearby for consumption. They were placed in a vertical position on the beach to facilitate introduction of the bill between the valves. During feeding on the meat inside the oysters were sometimes lying flat on the sand.

Part of the oysters was consumed some 3 m higher on the dike on the asphalt-covered cycle-track (fig. 4). All the oysters of figs 1 and 2 were collected here, as for these I am quite sure that Oystercatchers brought them, and I did see them feeding here. However, as soon as they discover a biker approaching, they fly away. So it is only in the quiet periods that they use the cycle-track, i.e. in the early morning before bikers (mainly tourists and people walking their dogs) disturb them.

The consumed oysters did hardly show traces of shell damage, sometimes only a small chip was broken form the posterior shell margin opposite the hinge (as observed earlier, Cadée 2001b). Not all the oysters I collected on the bike road had been opened by the oystercatchers. They might be brought by oystercatchers to the road and left there unopened when the birds were disturbed. Another possibility is that the birds were unable to open these still tightly closed specimens. My hypothesis is that the oystercatchers could open only those that were already slightly gaping after being left for some days out of the water. I opened myself some of these gaping ones and found the meat inside

Figure **4**. Pacific oyster consumed by Oystercatcher on the bike road along the Wadden Sea dike.

still fresh looking and not putrefied. From earlier observations here, during a mass mortality of the bivalve *Ensis directus*, I know that oystercatchers do not consume putrefied bivalves.

The sudden start of feeding on a food hitherto unexploited by oystercatchers normally known to be very specific in their food choice indicates that they can learn. It makes one curious to know whether the oystercatchers will also learn to feed on the rich food sources of oysters living on the Pacific oyster reefs.

DISCUSSION

Pacific oyster. -- In 1964, the Pacific oyster *Crassostrea gigas* has been introduced for cultivation in the province of Zeeland (southern part of the Netherlands) to replace the strongly over-fished and particularly after the severe winter of 1962/63 declined populations of the indigenous flat oysters *Ostrea edulis* L., 1758 (Drinkwaard, 1999). In the Wadden Sea, the first Pacific oysters were introduced around 1976 near Texel (Bruins, 1983). After a relatively long period they gradually increased in the western Wadden Sea, and around 2000 they started forming real reef structures (Cadée, 2000). The development of some of these reefs is now studied annually (Dankers et al., 2004; Fey et al., 2006).

Predation of larvae and spat of the Pacific oyster is little studied, but specimens of some cm length have apparently few predators. Spat settles preferably in the vicinity of other Pacific oysters. They live attached to solid objects, often to living oysters and grow

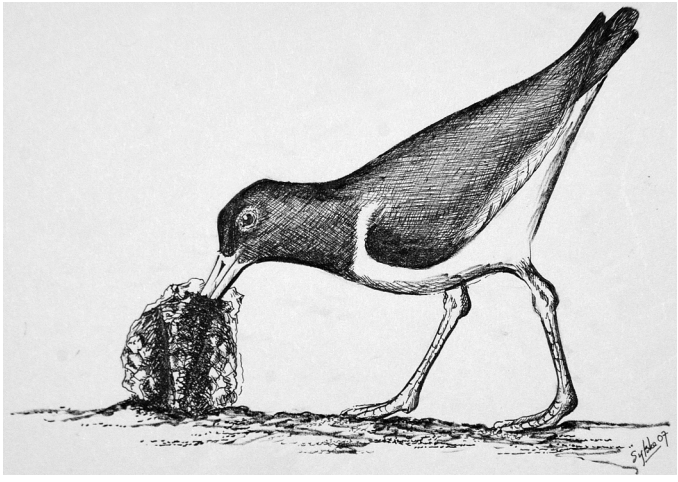

Figure **5**. An Oystercatcher feeding on a Pacific oyster. Drawing by Sytske Dijksen.

fast. Such strongly attached oysters often forming clusters appear to be difficult to attack by predators.

In the Wadden Sea, up to now only herring gulls have been observed to consume Pacific oysters (Cadée, 2001a). They feed only on single specimens that are not attached to (artificial) rocks or clumps of other oysters. These oysters attached as larvae to small objects, and are therefore easy to remove, to carry in the air and drop on a hard surface to crack for consumption. It is remarkable that the herring gulls do not exploit again the numerous unattached Pacific oysters that abound now near the high water line. In October they were still feeding here on shore crabs (Cadée, 2007b). The gulls even do not steal oysters from the oystercatchers although they are well known for their cleptoparasitic behaviour (Tuckwell & Nol, 1997b).

Oystercatchers. -- The European Oystercatcher is one of the best-studied shorebirds of the world. Study of its food and feeding habits started more than a century ago (Dewar, 1908). Dewar (1922) mentions some older observations going back to 1766. Hulscher (1996) has nicely reviewed these studies. It appears that oystercatchers have a large prey spectrum, but individuals differ in the feeding habit they adopt, i.e. they are specialists (Sutherland et al. 1996). Although individual birds may specialize for long periods on a single prey species, changes in diet do occur both in the short term (within a tidal cycle) and in the longer term both within and between seasons (Hulscher, 1996).

Dewar (1922) studied oystercatchers feeding in captivity on the flat oyster *Ostrea edulis*. The flat oyster has now disappeared from the Wadden Sea (Cadée, 2007a). Dewar's oystercatchers forced their beak in between the valves at the posterior edge. The actual process of opening was not observed. Damage to the shell margin was minimal. He concludes that oystercatchers were unable to open oyster shells that were tightly closed; the oysters needed to gape a little to enable the bird to insert its beak. This agrees with my hypothesis that Oystercatcher now open only slightly gaping (but in this case dying) Pacific oysters. Dewar also makes the interesting suggestion that formerly oysters were much more abundant in shallow water in Europe. Due to over-fishing they became restricted to deeper water and the oystercatchers had to move to mussels as their main

food source, but still the birds are named Oystercatcher (*Haemotopus ostralegus*, Austernfischer, Huîtrier-pie).

Up to now I had only once observed an Oystercatcher consuming a Pacific oyster (fig. 5). I am not aware of other similar observations in the Netherlands. In that earlier case the Oystercatcher was feeding on an oyster dropped by a herring gull, but left unopened (Cadée, 2001b). In the literature only Lunais (1975) reports on oystercatchers feeding on Pacific oysters. He reports on oyster cultures in France. Comparable to my observations these French oystercatchers were feeding on solitary specimens, ranging in size from 30 – 150 mm; only the oldest specimens of 2 and 3 years in the cultures were not attacked. Lunais observed oystercatchers introducing their beak between slightly gaping valves, but also mentions that they were able to open closed valves by vigorously hammering a small hole in one of the valves near the shell margin (where the shell is thinnest). Bent (1929) mentions American oystercatcher *Haematopus palliatus* to feed on the related *Crassostrea virginica* (Gmelin, 1791) by inserting its bill between the gaping valves of specimens in situ on the reefs this oyster forms. This is confirmed by Tuckwell & Nol (1997a). Butler & Kirbyson (1979) report on Black oystercatchers *H. bachmanni* feeding on Pacific oysters in British Columbia. The Black oystercatchers studied used a the hammering method to open the oysters: they hammered a hole in the shell and severed the adductor muscle. They opened mainly unattached oysters, but also a few attached to rocks.

CONCLUSION

The availability near the high water line of hundreds of single Pacific oysters, probably gaping, enabled the oystercatchers to feed on this new food source. This indicates they can learn to feed on a new food source as they did in the 1980s with the American razor clam. However, the European Oystercatcher will probably not learn to feed on the Pacific oysters living in large clusters on the reefs they form; they should have learned this already long ago as the reefs are present now for decades in Europe. Apparently the tightly closed Pacific oysters living in clusters and on reefs are unavailable for oystercatchers.

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