The ground also presents difficulties. Long stretches of unstable bowlders are interspersed with jagged lava potholes. There are cinder slopes and basaltic benches. In places the rocks are worn smooth as glass by the friction of innumerable seal bodies and the bowlders near the water line are always treacherous with slime and slippery sea growths. Over all is the unspeakable Bering Sea weather—without sunshine and alternating between thick and thin fog accompanied by rain, flying spray and howling wind.

The result, however, repaid the effort. For the first time the breeding stock of the herd has been brought within the range of exact figures. The herd is shown to be in better condition than was expected. Its recuperation will be more rapid. The splendid body of pups disproves absolutely the contention which has recently played so important a part in discussions of the herd's condition, namely, that the stock of breeding males has been reduced too low or become invirile and impotent through the operations of land killing. The immediate response of the herd to its release from the drain of pelagic sealing as certainly proves this to have been its sole cause of decline.

GEORGE ARCHIBALD CLARK
U. S. BUREAU OF FISHERIES,
ST. PAUL ISLAND, ALASKA,
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THE FUR SEAL MORTALITY OF THE PRIBILOF ROOKERIES IN THE ABSENCE OF PELAGIC SEALING[1]

THE breeding season of 1912 for the Pribilof fur seal was the first in many years unaffected by pelagic sealing. The herd has promptly responded to the removal of this determining check to its increase. The deaths on the rookeries reflected not only the arrest of pelagic sealing but the drop in the rate of natural mortality which has been much more rapid than the rate of decrease of the herd. The question of mortality was investigated in 1896 and 1897 by the Fur Seal Commission, and during the past season by the writer, the death of the young being the chief concern in both cases. The loss during the entire season, until the migration of the cows and pups late in the fall, has never been covered, but the major portion occurs earlier and indicates the proportions of the mortality from natural causes. In 1896 and 1897, putting aside the heavy loss from pelagic sealing by using only the data prior to August 15, the approximate date on which starvation caused by the pelagic catch began to be fatal to the young on the rookeries, the two chief causes of mortality of pups were uncinariasis (hookworm disease) and natural starvation, the former leading and placing a heavy incubus on the herd. The seal mother bears a single pup each year, and will nurse no other than her own offspring. Pelagic sealing therefore caused the starvation of the young by an artificial interference with the herd, while natural starvation is due to accidental deaths of females which have nursing pups and probably also to their failure to find their offspring after returning from trips to sea. It was estimated at 30.8 per thousand in 1896. The total loss from all causes in 1896 before the middle of August was about 90 per thousand.

The data obtained in 1912 make necessary some readjustment. The total natural loss to August 22 on St. Paul Island is 880, or 12.5 per thousand. From starvation to the middle of August a death rate of 4.3 per thousand is indicated, and from uncinariasis for the whole season a rate of much below 1 per thousand. Uncinariasis has thus become a minor and insignificant cause of loss, ranking not nigher than fourth, a result which must be due solely to the thinning out of the herd, for no artificial measures against *Uncinaria* have been applied. The worm could not be found on Polovina, Gorbatch and the Northeast Point rookeries, all formerly well infested. The old rookery strongholds for this disease in the sands of Zapadni, Reef and especially Tolstoi, are alone now occupied and they yielded only 17 uncinariated pups, 5 of which were associated with starvation, out of a total of 175 examined. By making these sandy

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areas rocky uncinariasis can probably be made and kept negligible.

Not so vulnerable are the rest of the natural losses and most of them are beyond the reach of any preventives man can apply. Starvation is perhaps still the most serious of these, but at least a close second are the constant and typical cases of asphyxia neonatorum, or suffocation of the new born, a hitherto unidentified fatality among the seals. This is an early loss, begins with the first births and of course ceases promptly with the last. Eighteen per cent. of the dead pups examined before the middle of August were thus asphyxiated, but as the autopsies did not begin (save for two cases) until July 23, when the height of the season was well passed, the indicated death rate of 2.3 per thousand is much too low. Pups dead of asphyxia neonatorum are promptly recognized by the presence of meconium and complete pulmonary atelectasis, or lungs without air. The meconium is made up of the products of metabolism of the fetus, accumulated in the large intestines during gestation, and is voided soon after birth. A few cases have only partial meconium and incomplete atelectasis. The immediate cause of the failure to establish breathing is inferred to be obstruction by the fetal membranes. Most pups are born more or less invested by parts of what was the bag of waters. The cow delivering her pup instantly proceeds to tear off the caul with her teeth, but she does not always succeed until after the pup is dead. The dead pups seldom show adhering membranes but one striking example, found on St. George Island by Mr. Clark, is significant. The caul was intact, fitted perfectly the whole head and effectually sealed the respiratory passages. Usually the little victims never get their first breath. Trampling or overlying at the critical moment probably prevents breathing in a few cases independently of the fetal membranes. There is no evidence that any of the pups examined was dead before birth.

In 1896 and 1897 this species of suffocation must have ranked third, or possibly second, in importance. Many of the earlier dead of those years, which were seen lying largely inaccessible in the heart of the harems and inferred to belong with the losses from *Uncinaria,* were probably suffocated at birth. It is characteristic of this loss that many of the dead are found in the original area of the harem as first formed, and all of them directly on breeding grounds. The pups die on the spot where born. Deaths from this cause will continue indefinitely, the defect in seal obstetrics being remediable by nature alone. But the loss may perhaps not increase much faster than *pari passu* with the growth of the herd, which is not the case with uncinariasis and apparently not with starvation and other losses. Roughly speaking there are now one third to one half as many breeding seals and young as in 1896; but the pup loss is one seventh and the adult loss one fifth that of 1896. As the various well-known losses have decreased in a much faster progression than the decrease of the herd, they may be expected to increase with its growth with corresponding rapidity, though the matter is to some extent influenced by such controllable factors as the proportion of bulls to cows.

The death of adult breeders is mainly from fighting, accidents of pregnancy and of other kinds. During the season of 1912 this loss was about 30 as against 159 in 1896.

An incidental discovery of less importance but of much interest, was made by Mr. Clark and the writer during the counting of the pups. It has been supposed that the ability to swim is not a birthright of the fur seal pup but an acquirement gained by diligent practise in August. The stampeding into the sea and ready swimming early in August of hundreds of pups which had never before been in the water, and corroborative observations, show that the pup can swim just as soon as it acquires sufficient strength and can manage its limbs.

M. C. Marsh
U. S. Bureau of Fisheries,
St. Paul Island, Alaska

Memorial of a Centenary

The interest of the annual meeting of the Academy of Natural Sciences of Philadelphia was enhanced by the presentation of an advance copy of the fifteenth volume of the