at various times during pupal and early adult life. Dissection of imaginal membranous wings from within the pupal cuticle is difficult at earlier stages, and larger sampling errors result. However, useful data were obtained, even with small numbers of wings. Counting was begun 7 days after the activation and continued until each wing had been counted twice. The interval between the two counts of any given sample was 5 days. The expected 14-day half-life was verified for each sample, and the counts were corrected for decay to an arbitrary time to make comparison possible. In Fig. 2 these values are plotted semilogarithmically as phosphorus activity per wing against the time of development at which the wing was sampled (solid curve). If we assume that the amount of phosphorus in wings 1 day after eclosion was the same as in the first experiment, the latest sample, taken 10 days after pupation, contained 0.005 μg of phosphorus per wing. The standard deviation for the five wings of this sample is 0.001 μg. This includes both the variation among the wings and the variation of the counts. The standard deviation of the counting of this smallest quantity (2×10^3 net counts in 1 hour) is only about 2 percent.

Observations by light and electron microscopy have revealed that after eclosion the hypodermal cells are lost from the wing. Failure to observe cell fragments suggests that this process is a transfer of whole cells from the wing. Accordingly, the observed decline in the phosphorus would reflect this loss. The curve seems to approach a constant value which would represent the amount of phosphorus in the wing structure exclusive of that in the hypodermal cells. When our estimate of this value, obtained by extrapolation (dotted line of Fig. 2), is subtracted from the data, an exponential curve results (broken line of Fig. 2). Our interpretation of this result is that the cells leave the wing at a rate proportional to the number in the wing—that is, randomly. This is in striking contrast with the pre-eclosion state of the hypodermal cell population (*1*). The cells were then a fixed population precisely synchronized in a regulated sequence of steps in differentiation and morphogenesis (*3*).

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3. This study is based on work performed under contracts with the U.S. Atomic Energy Commission. We are grateful to Dr. A. Kirschbaum and E. Hill for the use of the reactor and counting facilities and to R. Padden for technical assistance.
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3 August 1962

Secretion of Iodide by the Nasal Gland of Birds

Abstract. The nasal gland of the gull can secrete a solution of sodium chloride about 5 to 6 times more concentrated than that found in blood plasma. The gland can also concentrate iodide to several times the plasma concentration, but chloride seems to be preferred in the secretory process. These experiments were undertaken in the hope that a particularly high iodide clearance could form the basis of a method for determining the blood flow to the gland. The results made this approach to blood flow measurements unfeasible.

The main route of salt elimination in marine birds is through the nasal salt gland (*1*). The activity of this gland enables the birds to eliminate excess salt which is ingested with invertebrate food or sea water. In the herring gull, *Larus argentatus,* the secreted fluid may have a concentration of 0.8*M* with a chloride concentration 6 times greater than the concentration in the blood plasma. The fluid has a rather constant composition, with the principal ions of the blood plasma, sodium and chloride, making up most of its solutes. We therefore examined the ability of the gland to secrete other ions.

Iodide secretion was studied after either tracer amounts of radioactive iodide (I^{131}) or a massive dose of unlabeled iodide (I^{127}) had been injected. Since the nasal gland normally is active only during an osmotic load, secretion was stimulated by injection of 10 ml of a 10-percent NaCl solution into birds weighing 800 to 1000 g. All solutions were injected into leg veins, usually through a polyethylene catheter. To avoid contamination, all blood samples were withdrawn from a catheter in the opposite leg. After each withdrawal the catheter was flushed with saline containing heparin. The bird's upper beak was inserted into a vial to catch the nasal gland secretion. Urine samples were collected as they were eliminated. Chloride determinations were made by titration with silver nitrate and thiocyanate (*2*). The I^{131} was counted in a well scintillation counter, and the I^{127} was titrated with silver nitrate to a rose bengal end point (*3*). For the iodide titration the plasma and urine samples were deproteinized with $Ba(OH)_2$ and $ZnSO_4$ (*4*).

In one experiment on a 1-kg bird, 80 μc of I^{131} was injected and allowed to equilibrate for 25 minutes. The nasal gland was then stimulated with NaCl, and produced a copious secretion that continued in diminishing amounts for about an hour. The chloride content of the secreted fluid was high and relatively constant (Fig. 1). After a brief initial decrease in concentration paralleling that in the plasma, the iodide

Table 1. Excretion of toxic quantities of iodide in the herring gull with 10.3 m*M* NaI injected at time zero, and 17.2 m*M* NaCl injected at 48 minutes. *S*/*P* ratio, secretion concentration to plasma concentration ratio.

Time (min)	Volume (ml)	Concentration (m*M*)		*S*/*P* ratio		Cl^- preferment as % of I^-
		Cl^-	I^-	Cl^-	I^-	
			Plasma			
− 10		119				
35		98	33			
45		100	31			
53		152	22			
68		139	21			
			Gland secretion			
4	2.23	526	117	4.56	3.55*	128
10	1.66	543	110	4.85	3.34*	145
15	0.12	568	107	5.16	3.24*	159
49	1.65	770	76	4.90	3.42	143
55	1.23	755	76	5.02	3.46	145
60	0.33	795	78	5.49	3.58	153
65	0.18	796	82	5.69	3.84	148
			Urine			
3		122	75	1.03	3.20	32
54		145	85	0.96	3.86	24
63		159	67	1.06	3.11	34

* These ratios are based on iodide concentrations of plasma at 35 minutes.

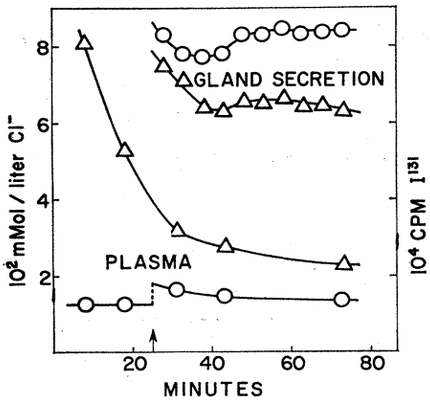

Fig. 1. Relative concentrations of chloride and iodide in the plasma and in the secretion from the nasal gland of a herring gull. Circles and left ordinate, chloride concentrations; triangles and right ordinate, iodide concentrations. Arrow at 25 minutes indicates the time of stimulation of gland secretion by intravenous injection of sodium chloride.

concentration of the secretion remained at an even level. The chloride concentration of the secretion was about 800 m*M* against 140 in the plasma, that is, the secretion concentration to plasma concentration ratio (*S/P* ratio) was about 6. The *S/P* ratio for iodide was about 2.5, showing that chloride was being removed about twice as effectively as iodide. In a second experiment the chloride level, and the fluid it produced *S/P* ratio was 3.5.

In another experiment, a toxic dose of 10 m*M* of tracer-free NaI^{127} was administered. The osmotic effect of this amount of NaI was sufficient to cause a short period of secretory activity by the nasal gland and it also produced salivary secretion and several urinations. The secretion produced in response to NaI contained considerable amounts of iodide, but was rather low in chloride (Table 1). After the secretion in response to the NaI had ceased, 17 m*M* NaCl was injected and the gland resumed activity at a low, irregular rate. This injection of salt elevated the plasma chloride level, and the fluid it produced had a typical high chloride content (700 to 800 m*M*). Despite the irregular volume of secretion, the chloride and iodide concentrations remained relatively constant. The *S/P* ratio for iodide in this experiment was greater than that in the tracer experiment but never equaled that for chloride.

Our results demonstrate that the sea gull nasal gland has a definite ability to concentrate and eliminate iodide. They also show that the gland exercises some degree of discrimination toward the anionic component of its secretion, as the secretion to plasma concentration ratio for chloride was never less than 130 percent of that for iodide. Thus, chloride seems to be preferred in the secretory process.

The chloride concentration in the urine samples which were collected in this experiment was equal to that in the plasma, while the iodide level was similar to that in the nasal gland secretion, which indicated that proportionately less iodide than chloride was being resorbed from the kidney tubules. It may be assumed that chloride resorption in the gull kidney, as in the mammalian kidney, is a passive movement following active sodium uptake. The preference for chloride over iodide shown in kidney reabsorption and nasal gland secretion may have a common basis, not in a specific mechanism for chloride transport, but perhaps in some physical property of these two ions which results in different rates of movement through cell barriers. The size of the hydrated ion is probably not a factor, for, as indicated by their ion conductivities (Cl^- 62.2, I^- 66.2) (*5*), chloride and iodide are quite similar in this respect (*6*).

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1 May 1962

Ellobiopsidae from the Pacific

Abstract. The parasite *Amallocystis capillosus* has appeared on the shrimp *Pasiphaea pacifica*. This is the first report of this group of parasites from the northeastern Pacific Ocean. The parasite causes a morphological modification of the rostrum of the host.

Members of the family Ellobiopsidae Coutiere, 1911, are known to parasitize various crustaceans from the North Atlantic (*1, 2*), the Antarctic region, and the southwestern Pacific (*1*). Organisms which may belong to this group have been reported from most of the world, but none of them have been adequately described and none have been placed definitively in the group (*1*). None have been reported from the northern or eastern Pacific.

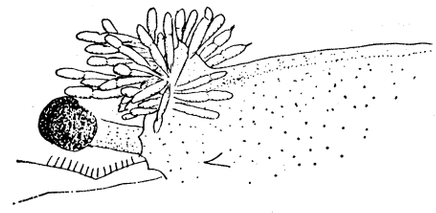

Fig. 1. Rostral portion of *Pasiphaea pacifica* parasitized with *Amallocystis capillosus.*

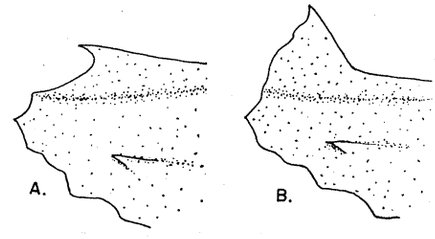

Fig. 2. The rostrum of *Pasiphaea pacifica. A*, Normal rostrum of a nonparasitized specimen. *B*, Distorted rostrum of a specimen parasitized with *Amallocystis capillosus.*

The phylogenetic position of the group is vague. Caullery (*3*) thought that certain of the species were related to the parasitic peridinians. Others have suggested that these parasites should be placed elsewhere among the flagellates (*4*), or that they might have affinities with unspecified fungi (*2*). Boschma (*1, 2*), Grasse (*5*), and others have chosen to retain these organisms near the parasitic peridinians although they realize that the evidence for such placement is extremely weak. In a review of the genus *Amallocyctis* Fage, Bergan (*6*) summarizes the literature on the group and concludes that there is not enough information to permit definitive placement of the ellobiopsids. Retention of these organisms in a doubtful position is preferable to transferring them to another on the basis of equally weak or weaker evidence.

Our collection contains one pelagic carid shrimp, *Pasiphaea pacifica* Rathbun, which is parasitized by *Amallocystis capillosus* Fage. This shrimp was taken, probably in the upper 200 m, with a midwater trawl (Isaacs-Kidd) from a research vessel *Acona* (*7*) about 15 miles west of the mouth of Coos Bay, Oregon (43°20.4′N, 124° 45.8′W).