

about 3 percent of the total urea excretion, the remainder being excreted by the gills. During acute transfer to 75 percent seawater there is an increase in total urea excretion of about 20 percent due to an elevation in renal urea excretion. In skates adapted to 50 percent sea water the total urea excretion is similar to that in sea water but then about 60 percent is excreted by the kidneys.

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### DIFFUSIONAL WATER FLUXES IN SKATES, *Raja erinacea* and *Raja radiata*

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Diffusional water permeability ( $^3\text{H}_2\text{O}$  efflux) was measured in the skates, *Raja erinacea* and *radiata*, which are able to adapt to a dilute environment. All experiments were carried out at a temperature of  $13^\circ \pm 1^\circ\text{C}$ . The values obtained for the two species of skates were similar and were grouped together. No significant difference was observed in the turnover of internal water ( $\lambda$ ) between the two groups of fish, those in sea water and those adapted to 50% sea water (Table 1). The cor-

TABLE I  
TURNOVER OF INTERNAL WATER IN INTACT AND HYPOPHYSECTOMIZED  
SKATES ADAPTED TO SEAWATER AND 50% SEAWATER

	SW		50% SW	
	INTACT	HYPOX	INTACT	HYPOX
$\lambda (\% \cdot \text{h}^{-1})$	$64.2 \pm 1.91$ (n=7)	$64.1 \pm 2.78$ (n=7)	$57.5 \pm 1.48$ (n=5)	$66.6 \pm 5.57$ (n=6)

Values are means  $\pm$  S.E. with numbers per group in parentheses.

responding diffusional water fluxes were  $52.6 \pm 1.57$  and  $52.3 \pm 1.35$  ml h<sup>-1</sup>.(100g)<sup>-1</sup> respectively for skates in SW and 50% SW, assuming water spaces of 82% (SW) and 91% (50% SW) of body weight (Goldstein and Forster, Am. J. Physiol. 220:742, 1971). Hypophysectomy did not produce significant alteration in the turnover of internal water in skates adapted to either SW or 50% SW (Table 1).

Previous values (units as above) obtained for water turnover in the dogfish, *Scyliorhinus caniculus* and in two Batoids, *Raja montagu* and *Torpedo marmorata* were  $156.6 \pm 13.08$  (n=14),  $167 \pm 11.1$  (n=4) and  $97 \pm 8.5$  (n=4). The values in *S. caniculus* and *R. montagu* are much higher than those found in *R. erinacea* and *radiata*. It may be noted that the experiments with the former species were conducted at a somewhat higher temperature  $16^\circ \pm 1^\circ\text{C}$  than those with the latter. The difference in values for turnover of water among these elasmobranchs suggests that those which can adapt to environmental dilution (*R. erinacea* and *radiata* and *T. marmorata*) possess a diffusional water permeability much lower than the dogfish, *S. caniculus*, which is incapable of resisting large variations in environmental salinity. Changes in environmental salinity produce large movements of water across the branchial epithelium. Elasmobranchs having a low water permeability may be able to adapt more easily to changes in environmental salinity than those having high water permeability. It would be interesting to measure the diffusional water permeability in Elasmobranchs which live permanently in fresh water such as *Potamotrygon*.

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#### METABOLISM OF <sup>14</sup>C-DDT BY THE WINTER FLOUNDER, *Pseudopleuronectes americanus*

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In response to concern over pollution of the marine environment, we are in the process of examining the handling of the persistent organochlorine pesticide, DDT, by a marine teleost, the winter flounder. Last summer we followed the tissue distribution of radioactivity at intervals from 15 minutes to 1 week after intravenous injection of ring-labeled <sup>14</sup>C-DDT (Bull. MDIBL 10:64-67, 1970). We have now extended these studies to examine the metabolism of the injected <sup>14</sup>C-DDT.

Ring-labeled <sup>14</sup>C-DDT was injected and tissue and body fluid samples were taken as described in last year's report (reference above). Two to four fish were sacrificed at intervals of 15 minutes, 1 hour, 4 hours, 8 hours 24 hours, 48 hours, and 1 week following injection. Tissues were chosen for analysis on the basis of previously demonstrated high content of labeled pesticide and/or vital function (liver, kidney, muscle, gonad, and brain). Plasma, bile, and urine were analysed to reveal the nature of pesticide in transit either within or from the body. All samples were extracted immediately since it had been shown in preliminary experiments that storage of intact tissue, even frozen, permits some breakdown of DDT over extended periods of time. For example, fresh flounder liver contained 90-95% DDT while liver frozen for 9 months had 60-90% DDD. On the other hand, the