

JUVENILE GROWTH AND NUTRITION IN TWO SPECIES OF CARPET SHARK (*HEMISCYLLIUM OCELLATUM* AND *HEMISCYLLIUM TRISPECULARE*)

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Abstract

Neonatal and juvenile nutrition is critical in establishing healthy individuals within any collection, especially for aquariums where elasmobranch pups receive no parental care. Because of this, newborns are wholly dependent on animal care professionals to provide high quality, nutritious diets and establish good feeding to support strong growth. The Seas with Nemo and Friends, Epcot acquired 3.0 aquaculture bred shark pups (2.0 epaulette sharks, *Hemiscyllium ocellatum* and 1.0 speckled carpet shark, *Hemiscyllium trispeculare*). *Hemiscyllium sp.* are a family of benthic shark species native to western Pacific reefs from northern Australia to Indonesia. They are popular in aquaria due to their modest mature size (ranging 75-107 cm), space requirement, and good temperament with tankmates. In the wild they consume a diet of small fish and invertebrates foraged from the reef and will readily consume an aquarium diet of a variety of frozen prey items (Table 1). Diet should be prepared in appropriately sized pieces that the small sharks can consume in a single bite. Once consumption has been established in newborn sharks, they are trained to consume food pieces off a feeding stick. This allows for the recording of individual consumption compared to broadcast feeding. We are presenting diet consumption and body weight data over the sharks' first approximately 250 days in our care, divided into six growth periods based on common weight dates (Table 2). The sharks arrived at between one and two months of age and had already been established on a diet of chopped shrimp and salmon fillets from the breeding facility. The sharks all increased diet consumption across the five periods (Table 3). Two of the three sharks had average daily weight gain increased across all periods (Table 4). Overall, the sharks had just over a nine times weight gain over the course of their first 250 to 263 days at our facility, with each shark increasing from an average initial BW of 14.7 g to an average BW of 136.9 g by the end of period 5 (Figure 1). The sharks' efficiency of weight gain (feed/gain) varied by period, ranging from 1.42 to 4.53 g of feed per g of weight gain (Table 5). This data set shows what a critical role nutrition plays in supporting the rapid growth and development of young *Hemiscyllium sp.* pups.

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Table 1. Average daily diet and nutrient content consumed by three shark pups (2.0 epaulette sharks, *Hemiscyllium ocellatum* and 1.0 speckled carpet shark, *Hemiscyllium trispeculare*) in periods 1 and 5 of care at The Seas with Nemo and friends, Epcot.

Diet Items, g	Epaulette Shark 1		Epaulette Shark 2		Carpet Shark 1	
	1 ¹	5 ²	1 ¹	5 ³	1 ¹	5 ³
Squid - no head, pieces	-	0.3817	0.0870	0.1685	0.0991	0.1960
Capelin - no head/tail	-	0.4496	0.1240	0.2400	0.1775	0.2500
Superba krill – peeled	0.0006	-	-	-	-	0.0000
Shrimp - peeled	0.0191	0.4938	0.1200	0.3769	0.1044	0.4463
Silverside	0.0031	0.3351	0.0050	0.0000	0.0219	0.0000
Lake Smelt	-	0.3332	0.0050	0.3300	0.0094	0.2963
Glass minnow	0.0204	0.2206	0.0150	0.0722	0.0275	0.0722
Bonita - fillet	0.0203	-	-	-	-	-
Salmon - fillet	0.0563	-	-	-	-	-
Herring - fillet	0.0327	-	0.0690	0.0000	0.0913	0.0000
Mackerel - fillet	0.0600	-	0.1190	0.2157	0.1078	0.2176
Chopped clam	-	-	-	0.2019	0.0125	0.2204
Mackerel liver	-	-	-	0.3167	-	0.3533
Live foods ⁴	-	-	0.1540	0.0241	0.1659	0.0315
Total	0.2125	2.2140	0.5440	1.9219	0.6514	2.0521

Composition (DM basis)	Epaulette Shark 1		Epaulette Shark 2		Carpet Shark 1	
	1 ¹	5 ²	1 ¹	5 ³	1 ¹	5 ³
DM, %	28.50	20.79	22.61	21.24	22.33	21.37
Protein, %	72.79	76.96	80.31	78.00	78.73	78.19
Fat, %	21.95	12.21	12.47	10.00	13.74	9.62
Calcium, %	0.59	1.37	0.57	0.74	0.72	0.68
P, %	1.09	1.59	1.23	1.33	1.30	1.30
GE, kcal/g	5.93	5.51	5.69	5.67	5.72	5.67

Daily Nutrient Intake	Epaulette Shark 1		Epaulette Shark 2		Carpet Shark 1	
	1 ¹	5 ²	1 ¹	5 ³	1 ¹	5 ³
Protein, g/d	0.04	0.35	0.10	0.32	0.11	0.34
Fat, g/d	0.01	0.06	0.02	0.04	0.02	0.04
GE, kcal/d	0.36	2.54	0.70	2.31	0.83	2.49

¹Period 1 – 1-31 days in care

²Period 5 – 169-250 days in care

³Period 5 – 157-263 days in care

⁴Live food was provided as enrichment and are not included in nutrient consumption calculations

Table 2. Growth period and corresponding days of care of three shark pups (2.0 epaulette sharks, *Hemiscyllium ocellatum* and 1.0 speckled carpet shark, *Hemiscyllium trispeculare*) at The Seas with Nemo and friends, Epcot.

Period	Time in Care (d)
1	1 - 31
2	31 - 87/85 ¹
3	88 - 124 / 86 - 126
4	125 - 168 / 127 - 156
5	169 - 250 / 157 - 263

¹ep. shark 1/ep. shark 2 & carpet shark

Table 3. Average daily feed intake (g/d) by period of three shark pups (2.0 epaulette sharks, *Hemiscyllium ocellatum* and 1.0 speckled carpet shark, *Hemiscyllium trispeculare*) in periods 1 and 5 of care at The Seas with Nemo and friends, Epcot.

Period	Epaulette Shark 1 ¹	Epaulette Shark 2 ²	Speckled Carpet Shark ²	Average
1	0.21	0.54	0.65	0.47
2	0.37	0.60	0.78	0.58
3	0.97	1.05	1.33	1.12
4	1.29	1.38	1.61	1.42
5	2.21	1.92	2.05	2.06

¹Periods 1: 1-31 d; 2: 31-87 d; 3: 88-124 d; 4: 125-168 d; 5: 169-250 d

²Periods 1: 1-31 d; 2: 31-85 d; 3: 86-126 d; 4: 127-156 d; 5: 157-263 d

Table 4. Average daily weight gain (g/d) by period of three shark pups (2.0 epaulette sharks, *Hemiscyllium ocellatum* and 1.0 speckled carpet shark, *Hemiscyllium trispeculare*) in periods 1 and 5 of care at The Seas with Nemo and friends, Epcot.

Period	Epaulette Shark 1 ¹	Epaulette Shark 2 ²	Speckled Carpet Shark ²	Average
1	0.07	0.12	0.17	0.12
2	0.26	0.38	0.36	0.33
3	0.35	0.25	0.39	0.33
4	0.44	0.35	0.54	0.44
5	0.87	0.73	0.62	0.74

¹Periods 1: 1-31 d; 2: 31-87 d; 3: 88-124 d; 4: 125-168 d; 5: 169-250 d

²Periods 1: 1-31 d; 2: 31-85 d; 3: 86-126 d; 4: 127-156 d; 5: 157-263 d

Table 5. Calculated feed to gain ratio of three shark pups (2.0 epaulette sharks, *Hemiscyllium ocellatum* and 1.0 speckled carpet shark, *Hemiscyllium trispeculare*) in periods 1 and 5 of care at The Seas with Nemo and friends, Epcot.

Period	Epaulette Shark 1 ¹	Epaulette Shark 2 ²	Speckled Carpet Shark ²	Average
1	3.04	4.53	3.83	3.80
2	1.42	1.58	2.18	1.72
3	2.76	4.19	3.41	3.46
4	2.92	3.93	2.98	3.28
5	2.54	2.63	3.31	2.83

¹Periods 1: 1-31 d; 2: 31-87 d; 3: 88-124 d; 4: 125-168 d; 5: 169-250 d

²Periods 1: 1-31 d; 2: 31-85 d; 3: 86-126 d; 4: 127-156 d; 5: 157-263 d

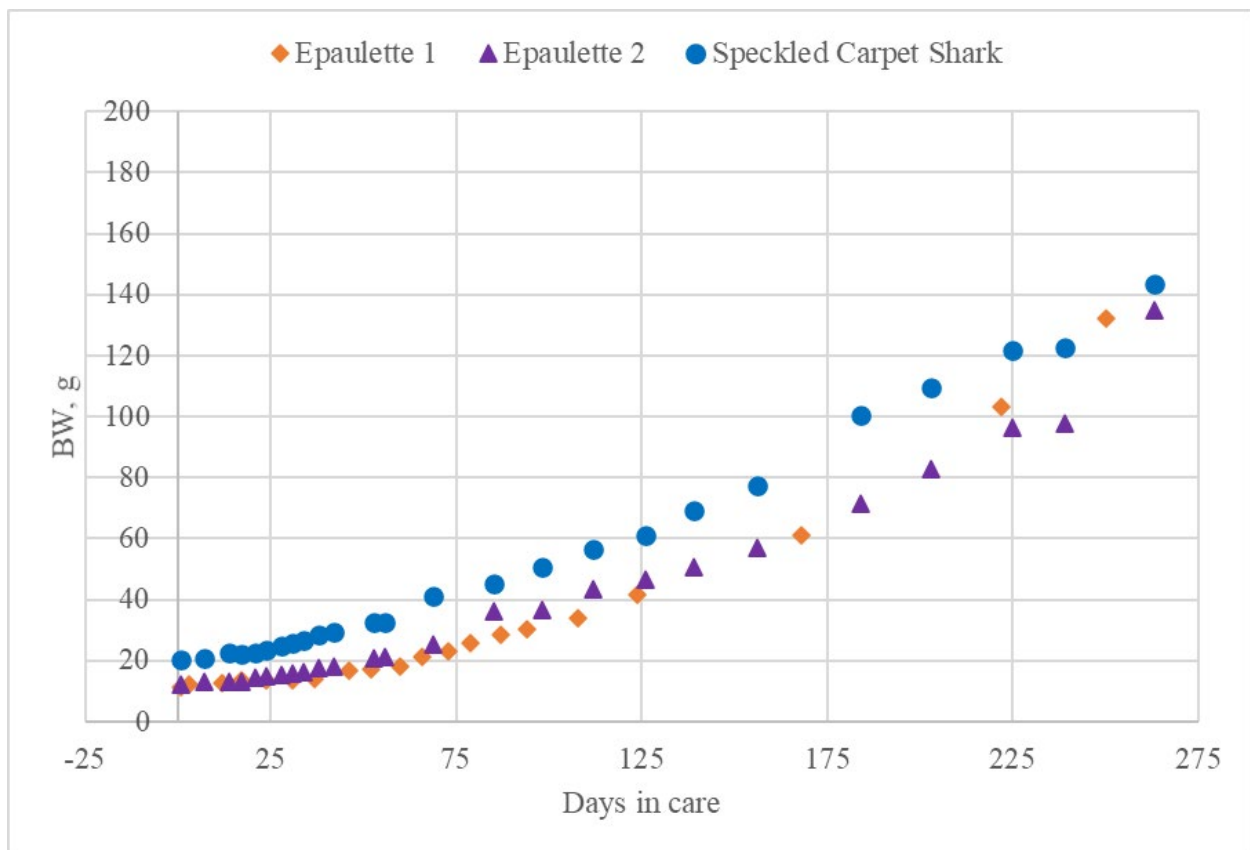


Figure 1. Body weight gain of 3.0 *Hemiscyllium sp.* shark pups at The Seas with Nemo and Friends, Epcot.