HOW FAST DO DOLPHINS REALLY SWIM?

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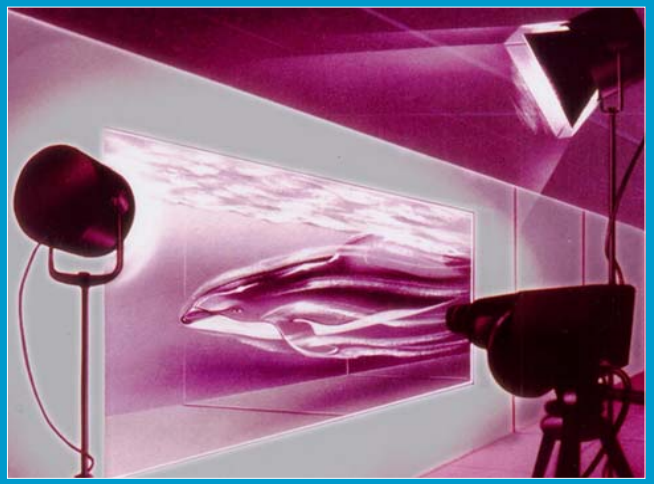
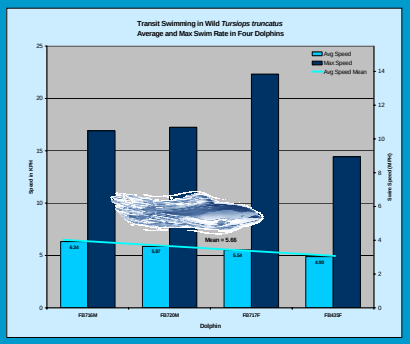
Answers to questions about dolphin swimming speeds usually are based on accounts in the popular literature, observations of trained dolphins, and measurements made in early studies of dolphin swimming capabilities that suggest these animals can reach speeds up to 29 km per hour (kph) (Rohr *et al.*, 1998). Although these animals are capable of reaching such speeds, researchers predict the normal transit and diving speeds of dolphins are more conservative in order to avoid fatigue (Williams *et al.*, 1993). Also, swimming effort should logically vary depending on species, ecological factors, and habitat. The Navy Marine Mammal Program had its beginnings in studying the hydrodynamic adaptations of dolphins and answering basic questions about dolphin swimming abilities. Today, our focus is to maintain our trained animals in proper physical condition while preventing undue stress and fatigue.



To derive an answer for this question for bottlenose dolphins, swim speed measurements from three behavioral studies on trained and wild dolphins were reviewed and analyzed. Precise velocity data in these studies was collected using time-depth recorders. One study involved dolphins trained for open water diving tasks (Shippee *et al.*, 1994). Two other studies were with tagged wild dolphins being tracked for 4.2 to 24.5 hrs (Shippee *et al.*, 1995). For this analysis, the data were divided into two categories: 1) diving speeds and 2) transit (surface) swimming. Results showed an average transit swimming speed of 5.66 kph, and a maximum speed of 22.3 kph. The diving category showed an average diving speed of 5.64 kph on descent and 8.08 kph on ascent.

Clearly, the best answer for "how fast do dolphins really swim?" is that although they can sprint at 29 kph, they generally move at a much slower pace, averaging 6.0 kph (~3.7 mph).



Transit Swimming in wild dolphins

Study Year	Animal ID	Track Length (mins)	Average Speed kph	(mph)	Maximum Speed kph	(mph)	Time above: 9.0 kph		10.8 kph	
Beaufort 1995	FB716M	415.0	6.3	3.9	16.9	10.5	33.6 mins	8.1%	2.9 mins	0.7%
Beaufort 1995	FB720M	311.0	5.9	3.6	17.2	10.7	21.1 mins	6.8%	1.1 mins	0.4%
Beaufort 1995	FB717F	854.0	5.5	3.4	22.3	13.8	13.8 mins	1.6%	2.8 mins	0.3%
Cape May 2002	FB435F	1204.0	4.9	3.0	14.4	9.0	3.2 mins	0.3%	0.3 mins	0.0%
Total Time and Averages:		**2784.0**	**5.7**	**3.5**	**17.7**	**11.0**	**17.9 mins**	**4.2%**	**1.8 mins**	**0.4%**

References:

Rohr, J. J., Hendricks, E. W., Quigley, L., Fish, F. E., Gilpatrick, J. W., Scardina-Ludwig, J. (1998, April). Observations of dolphin swimming speed and Strouhal number. SPAWAR Systems Center, San Diego Technical Report 1769.

Shippee, S. F., Chun, N. K. W., and Williams, T. M. (1994). Conditioning bottlenose dolphins (*Tursiops truncatus gilli*) for voluntary diving studies. Marine Mammals: Public Display and Research (IMATA), 1: 1-9.

Shippee, S. F., Townsend, F. I., Deckert, F. L., Gates, D. L., and Alcalay, O. M. (1995). A tracking and monitoring system for free swimming dolphins using a Trac Pac dorsal fin tag. Proceedings of the 1995 IMATA conference, Las Vegas, NV.

Williams, T. M., Friedl, W. A., and Haun, J. E. (1993). The physiology of bottlenose dolphins (*Tursiops truncatus*): Heart rate, metabolic rate, and plasma lactate concentration during exercise. J. Exp. Biol., 179: 31-46.

Williams, T. M., Davis, R. W., Fuiman, L. A., Francis, J., Le Boeuf, B. J., Horning, M., Calambokidis, J., and Croll, D. A. (2000). Sink or Swim: Strategies for cost-efficient diving by marine mammals. Science, 288: 133-136.

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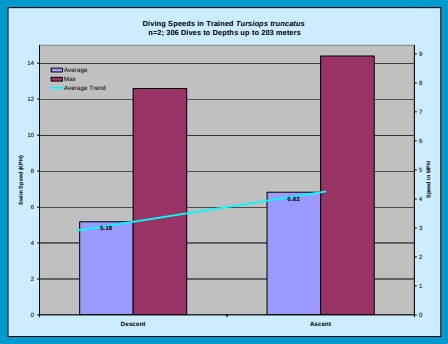
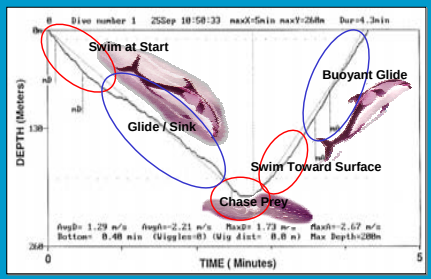
DIVING



Do dolphins swim faster when diving? Actually, the opposite seems to be the case. In order to conserve oxygen, marine mammals appear to expend very little effort swimming after descending past 70 meters, when the air in the lungs has compressed. After that, they sink down to depths fairly motionless. They again swim at the bottom of the dive to begin their ascent and become motionless as the air in the lungs gets more buoyant (Williams *et al.*, 2000). Our studies showed that dolphins descend slower than they ascend, at speeds similar to surface swimming.

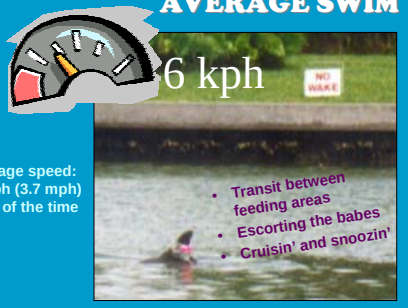


FAST SWIM

Speeds >9.0 kph rare, less than 5% of the time

- Chasing prey
- Avoiding predators & boats
- Social play

AVERAGE SWIM



Average speed: 6.0 kph (3.7 mph) most of the time

- Transit between feeding areas
- Escorting the babes
- Cruisin' and snoozin'

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