Catamaran v. monohull: myths, perceptions and reality

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Catamaran v. monohull: myths, perceptions and reality

Are the following statements true or false?

1. Catamarans capsize, monohulls don't
2. Monohulls sink, catamarans float
3. Catamarans are more expensive than monohulls
4. Catamarans are faster than monohulls
5. Catamarans make you seasick

1. Catamarans capsize, monohulls don’t.

Sort of true, but not really

2. Monohulls sink, catamarans float.

generally true.

3. Catamarans are more expensive than monohulls.

Yes, but then again no

4. Catamarans are faster than monohulls.

No, but ……

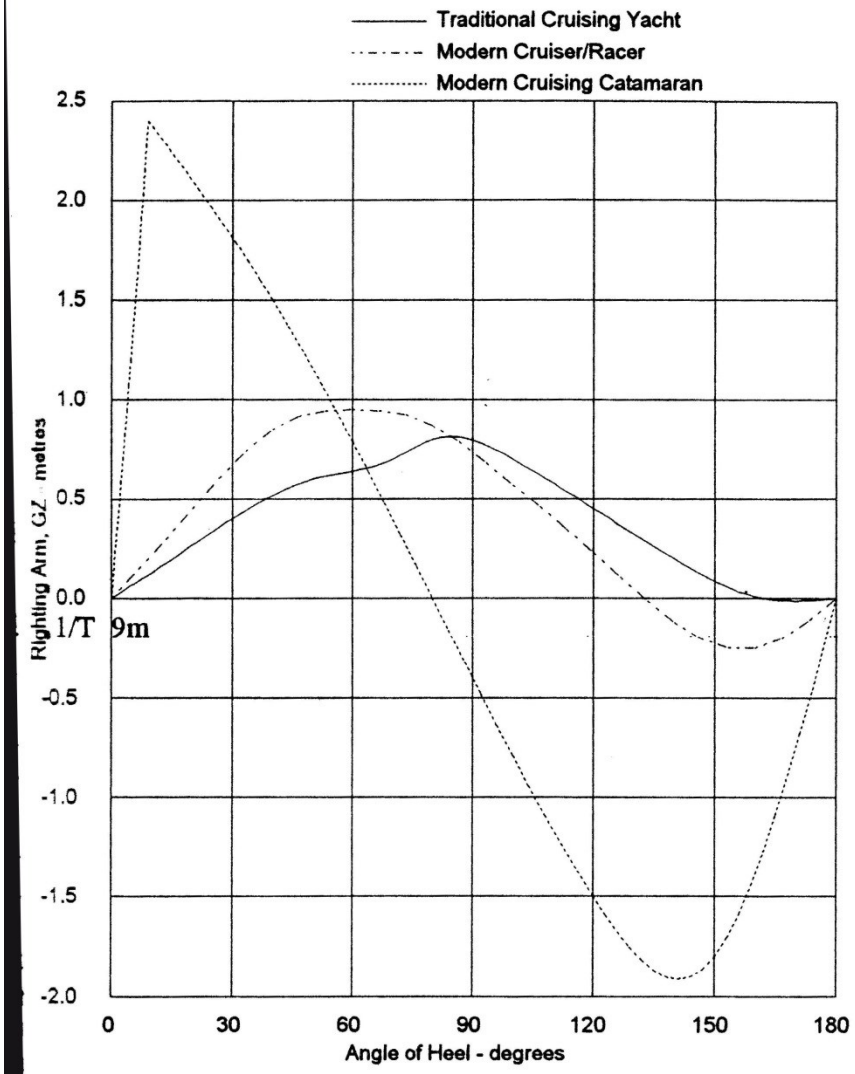
5. Catamarans make you seasick.

Yes and No

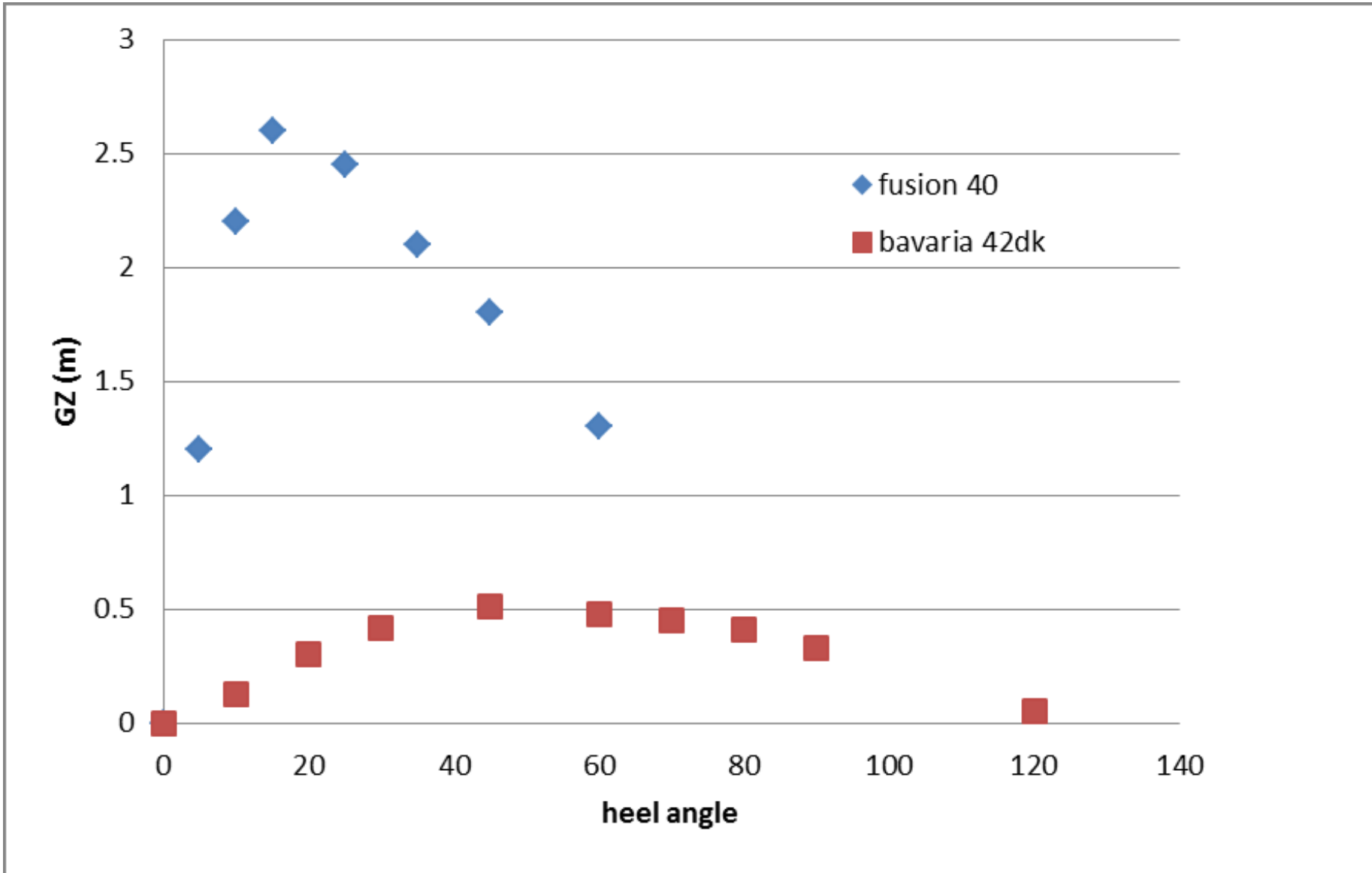
1. Catamarans capsize, monohulls don't?
Depends on capsize mechanism

- Wind
- Waves
- Max RM
- Energy balance
- AVS

Stability:
what we were told
(Claughton et al 1998)



Stability: real data (2015)



1. Catamarans capsize, monohulls don’t.

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Conclusion (controversial?)

- Many cats and monos can be classified as ISO 12215 Cat A standard
- Therefore for practical purposes they can be considered equally likely to capsize

2. Monohulls sink, catamarans float.

2. Monohulls sink, catamarans float.

A puzzle: The Yachting Australia regulations on flotation

For multihulls:

- "Adequate watertight bulkheads and compartments in each hull shall be provided to ensure that a multihull is effectively unsinkable and capable of floating in a stable position with at least half the length of one hull flooded" (3.05.1)
- "A hull shall have a watertight bulkhead either within 15% of LOA from the bow…." (3.05.4)

And for monohulls"

- Nothing!

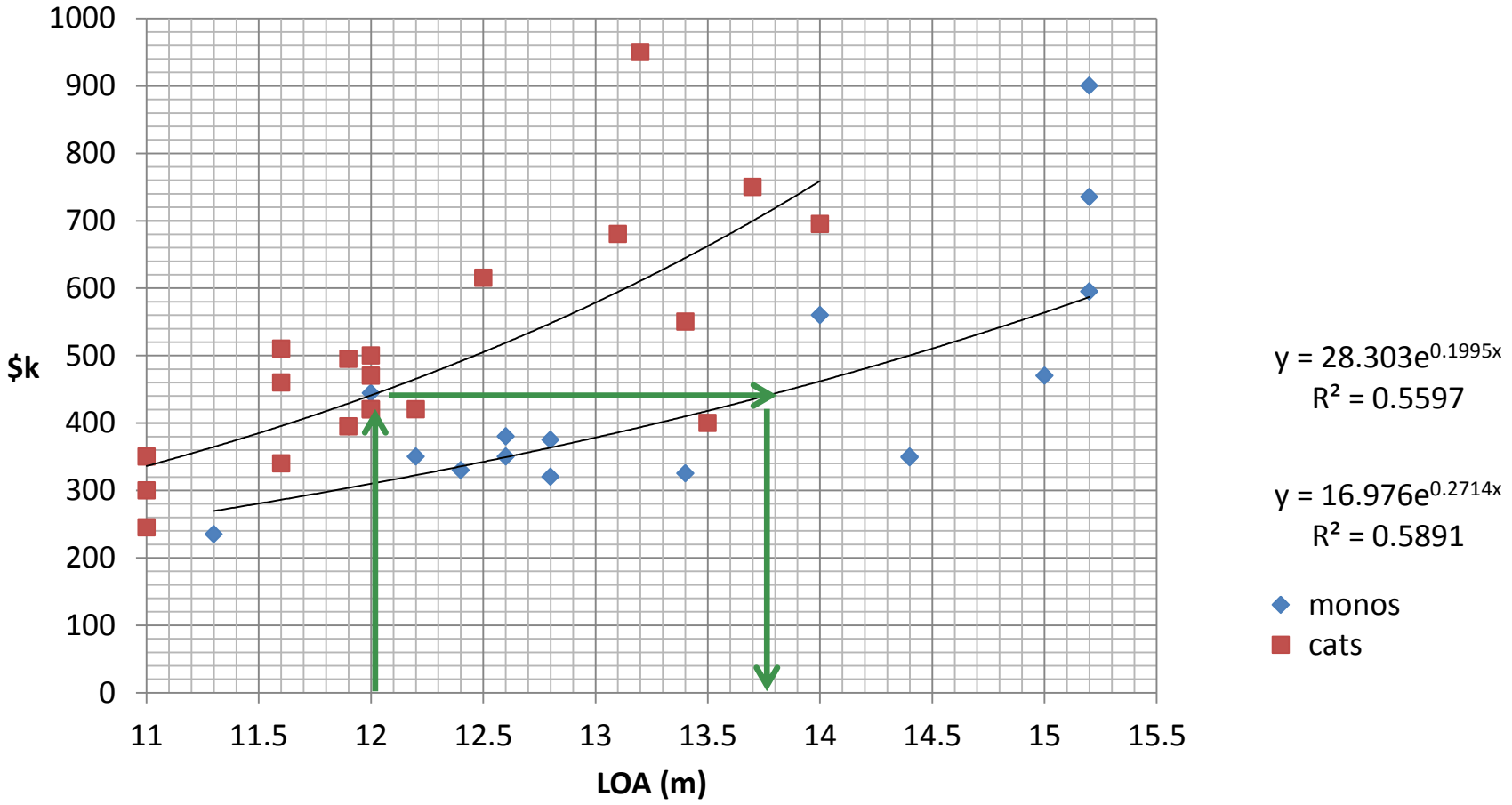
So why do YA safety regs require flotation for multihulls (which probably float) but not for monohulls (which probably sink)?

Another puzzle

- Why don’t we make monohull cabin sole watertight, thereby creating a double bottom?

3. Catamarans are more expensive than monohulls.

1-> 6 yrs old; 14 monohulls, 18 cats



What do you get for your money? Dollar for dollar…….

	Cat: mono (%)
Length	87
Weight	68
draft	50
Sail area	84
Saloon area	112
Cockpit area	148

So, for a given price, the cat is:

- Shorter - helps offset the marina fees.
- Lighter - potentially faster, but not as much load carrying capacity.
- Shallower -better for shallow water but potentially slower to windward.
- Less sail area - lower loads so easier to handle.
- More saloon area - take this with a pinch of salt, it depends on what's included.
- More cockpit area - an advantage when under way and in port.

4. Catamarans are faster than monohulls : The Bali 2013 data set

- 9 monohulls, 5 cats. All cruisers, not racers
- LOA 10.5 – 15.3m
- Distance 1440 miles
- Passage times (incl. stops) 238 – 309 hrs
- Passage times (at sea only) 215 - 280 hrs

4. Catamarans are faster than monohulls

a) Per metre LOA

	total voyage time	
	Fn	
cat	0.48	
mono	0.50	

	corrected for stopping	
	Fn	
cat	0.56	
mono	0.56	

Cost number

$$Fn_{cost} = \frac{V}{\sqrt{\$/_{100}}}$$

Where V = av speed (kn)

$ is from regression equation on previous graph

4. Catamarans are faster than monohulls
b) Per $

	total voyage time	
		Fn cost
cat		2.40
mono		2.74

	corrected for stopping	
		Fn cost
cat		2.83
mono		3.07

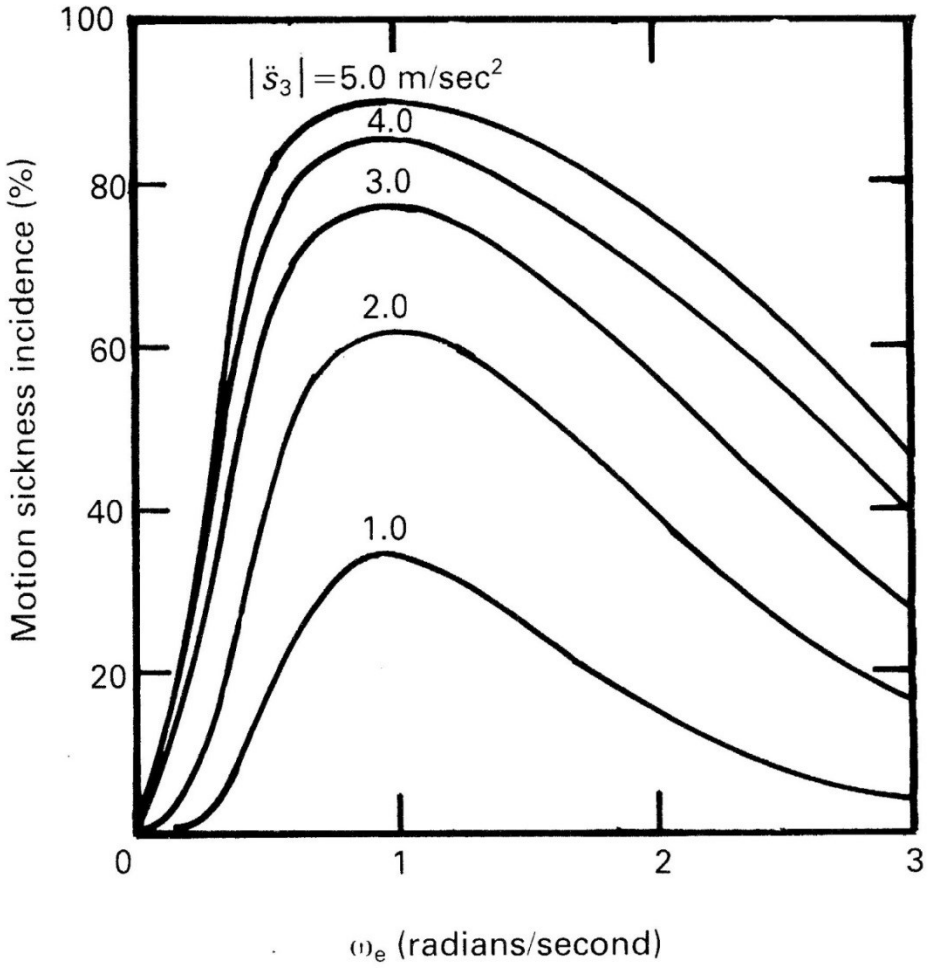
4. Catamarans are faster than monohulls.

	total voyage time	
	Fn	Fn cost
cat	0.48	2.40
mono	0.50	2.74

	corrected for stopping	
	Fn	Fn cost
cat	0.56	2.83
mono	0.56	3.07

5. Catamarans make you seasick

MSI rate for 2 hour exposure



Lloyd (1989)

5. Catamarans make you seasick.

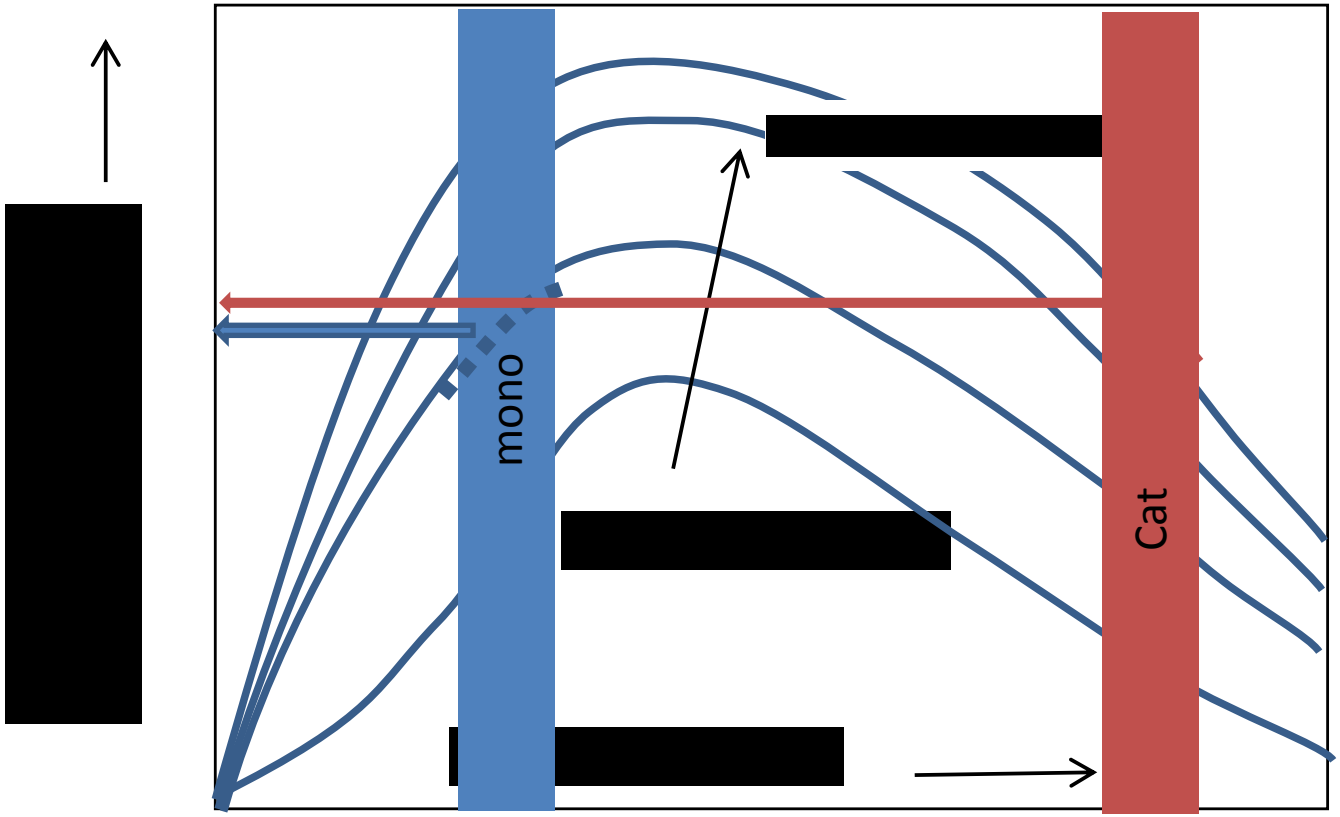
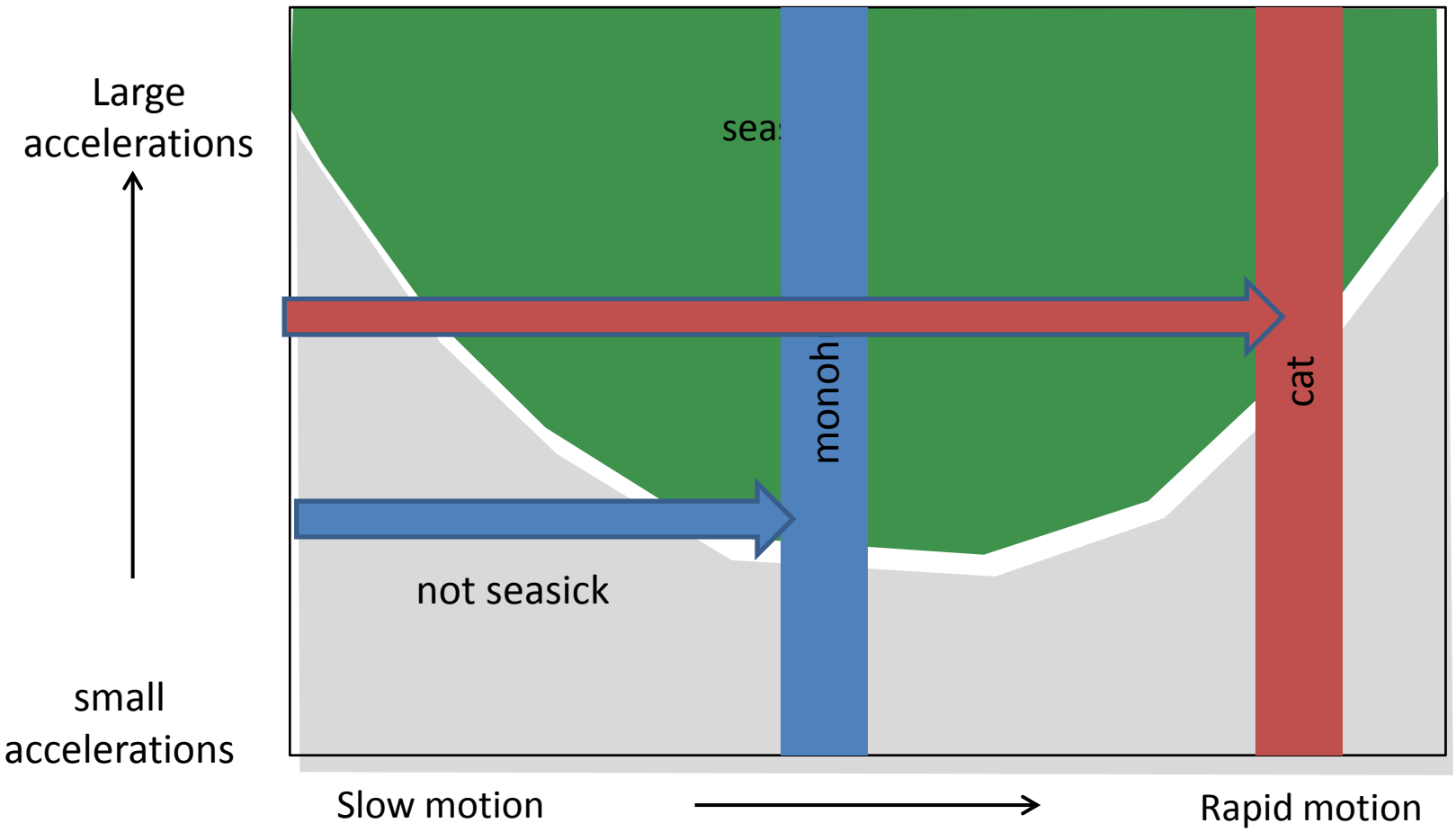


Figure 1: how motion affects sea sickness

5. Catamarans make you seasick



However…

- The curves are statistical averages; everyone reacts differently.
- Accn magnitudes on a cat are often greater, which increases sickness.
- Curves are for vertical accelerations; horizontal accelerations are also important, and they are higher on a cat than a monohull (the “train-ride” effect).
- The motion experienced depends on the waves you are in. The boat that makes you seasick in open ocean swells might be fine for semi-sheltered coastal passages.

How to conclude?

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quality					
Capsize					
Flooding					
Interior volume					
Cockpit & deck space					
Speed					
Motion at sea					
Motion at anchor					
Berthing					
anchoring					

Quality scores out of 5: 1 = poor, 5 = great

How to conclude?

quality	Mono	Cat			
Capsize	4	3			
Flooding	2	4			
Interior volume	4	3			
Cockpit & deck space	3	5			
Speed	3	3			
Motion at sea	4	3			
Motion at anchor	2	4			
Berthing	4	2			
anchoring	3	4			

Quality scores out of 5: 1 = poor, 5 = great

How to conclude?

quality	Mono	Cat	Importance		
Capsize	4	3			
Flooding	2	4			
Interior volume	4	3			
Cockpit & deck space	3	5			
Speed	3	3			
Motion at sea	4	3			
Motion at anchor	2	4			
Berthing	4	2			
anchoring	3	4			

Quality scores out of 5: 1 = poor, 5 = great

Importance scores 1= unimportant, 5 = critically important

How to conclude?

quality	Mono	Cat	Importance		
Capsize	4	3	4		
Flooding	2	4	4		
Interior volume	4	3	3		
Cockpit & deck space	3	5	3		
Speed	3	3	4		
Motion at sea	4	3	2		
Motion at anchor	2	4	4		
Berthing	4	2	3		
anchoring	3	4	4		

Quality scores out of 5: 1 = poor, 5 = great

Importance scores 1= unimportant, 5 = critically important

How to conclude?

quality	Mono	Cat	Importance	Mono rating	Cat rating
Capsize	4	3	4		
Flooding	2	4	4		
Interior volume	4	3	3		
Cockpit & deck space	3	5	3		
Speed	3	3	4		
Motion at sea	4	3	2		
Motion at anchor	2	4	4		
Berthing	4	2	3		
anchoring	3	4	4		

Quality scores out of 5: 1 = poor, 5 = great

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How to conclude?

quality	Mono	Cat	Importance	Mono rating	Cat rating
Capsize	4	3	4	16	12
Flooding	2	4	4	8	16
Interior volume	4	3	3	12	9
Cockpit & deck space	3	5	3	9	15
Speed	3	3	4	12	12
Motion at sea	4	3	2	8	6
Motion at anchor	2	4	4	8	16
Berthing	4	2	3	12	6
anchoring	3	4	4	12	16

Quality scores out of 5: 1 = poor, 5 = great

Importance scores 1= unimportant, 5 = critically important

How to conclude?

quality	Mono	Cat	Importance	Mono rating	Cat rating
Capsize	4	3	4	16	12
Flooding	2	4	4	8	16
Interior volume	4	3	3	12	9
Cockpit & deck space	3	5	3	9	15
Speed	3	3	4	12	12
Motion at sea	4	3	2	8	6
Motion at anchor	2	4	4	8	16
Berthing	4	2	3	12	6
anchoring	3	4	4	12	16
Weighted total				***97***	***108***

Quality scores out of 5: 1 = poor, 5 = great

Importance scores 1= unimportant, 5 = critically important