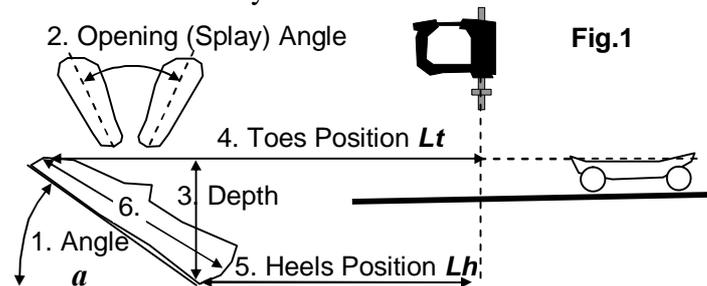


**Q&A**

**Q:** A sculler Dmitry Khmylnin from Kamensk-Uralskiy, Russia asks: “How to set up the stretcher properly in sculling?”

**A:** It is difficult to give exact settings of the stretcher as they depend on many variables of the rower, boat and oars, which need to be measured and modelled. The most efficient method is to use the practical recommendations, which are suggested below. The following measures define settings of the stretcher (Fig.1): 1) Stretcher angle and 2) opening angle (splay), 3) depth, 4) positions of toes and 5) heels. Size of shoes (6) affects geometry of the stretcher, but can not be chosen freely as it must fit the feet.



Opening angle 2 (splay) is usually fixed by boat design and can't be changed without redesigning of the shoes mounting plate. Only “New Wave rowing shoe fixing system” (14) allows its easy adjustment. Though manuals suggest splay 25 deg (7, 13), measurements give it in a range 0-12 deg with average 6 deg (1). Splay affects feet pressure distribution: wider angle shifts it to the inside of the feet and vice versa.

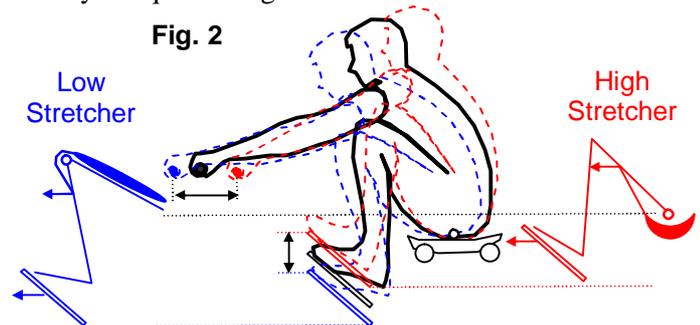
Stretcher angle should be set first as it affects other settings. Usually was measured (1) in the range 37-47 deg, average 42 deg and the recommended value (6, 13) 40 deg. The principles are:

- Flatter angle allows quicker placement of the heels during the drive (so, the gluts and hamstrings muscles can be used earlier, see RBN 2008/07), but it is limited by ankle flexibility at extension: too flat angle doesn't allow full knees extension at finish.
- Steeper angle allows more horizontal force application during the drive, which makes it more effective (RBN 2011/03), but it is limited by ankle flexibility at flexion: too steep angle makes it more difficult to compress at catch.

Attempts were made to combine above advantages, so the stretcher plate was made angled with a steeper toes part and a flatter heels part (3). Our advice: **Set the stretcher angle as flat as it doesn't make any ankle tension at extension at finish.**

The stretcher depth is traditionally measured as a vertical distance between the bottom corner inside the shoes and top of the seat. Its recommended range is 15-19 cm, measured (1) 12-22cm, average 17 cm. The following rules affect individual adjustments (Fig.2):

- Lower stretcher allows longer handle position at catch, but limits force application, because a rower could be lifted from the seat and lose it (RBN 2002/05). Also, lower stretcher allows easier compression at catch, increases quads utilisation, but prevents early usage of hamstrings and gluts. Quite often lowering the stretcher is limited by ends of the seat tracks, which cut into the rower's calves
- Higher (and steeper) stretcher allows more horizontal drive and bigger force application (5, 21), but makes compression at catch more difficult. It allows early usage of hamstrings and gluts (and trunk opening), but not easy for quads usage.



Our advice: **Set the stretcher depth to provide an optimal compression at catch: shins are vertical, knees at armpit level and contact with seat is maintained at your strongest efforts.**

Finally, the horizontal position of the stretcher should be set up as it can be adjusted quickly and does not affect other settings. It is measured from the line of the pins and various sources recommend measuring at the toes *Lt* (Fig.1, 4) or heels *Lh* (5). Both of these measures can be used as they are simply interrelated:

$$L_t = L_h + L_s * \cos(a)$$

,where *Ls* – length of the shoes, *a* - stretcher angle. Measured at toes, *Lt* ranges at 50-70 cm and it depends on many factors: rower's height / legs length, shoulders width and trunk breadth, inboard/span/overlap, trunk angle at finish. The position of the stretcher affects the catch and finish angles:

- Moving the stretcher towards the stern increases catch angle (see the ratio in RBN 2007/02) and, possibly, total angle, if the finish angle is maintained. However, this requires longer trunk work at finish, which may cause excessive energy losses.
- Moving the stretcher towards the bow increases finish angle and could be used to reduce trunk activity at finish, providing there is good compression at catch. Excessive finish angle could cause pulling the oars inwards, especially at narrow sculler's shoulders, wide span and low handles.

We would suggest following the traditional advice: **At correct stretcher position, the top of the handles must slightly touch ribs, when legs are straight and trunk is vertical.** Also, a good indicator is a perpendicular angle between a forearm and an oar at finish.

## References.

1. Aitken S., et al. (2011) Rigging survey at World Rowing Junior Championships 2011. British Rowing RowHow Rigging Forum. <http://www.britishrowing.org/education-training/rowhow>
2. Adam K, Lenk H., & Schroder W. (1982). Kleine Schriften zum Rudertraining. (pp. pp.268-272). Bartels&Wernitz Druckerei und Verlag KG, Germany,.
3. Bat Logic Bioseries Shoe plate.  
<http://www.batrowing.com/Bioseries/WHYBIOSERIES/tabid/198/Default.aspx>
4. Burnell, R. (1973). The Complete Sculler. Simpson of Marlow.
5. Caplan N., Gardner T. (2005) The Influence of Stretcher Height on the Mechanical Effectiveness of Rowing. Journal of applied biomechanics, 21, 286-296
6. Daigneault, T., Smith, M., & Nilsen, T. S. (2002). FISA Intermediate Rigging Level 2.
7. Davenport, M. (2002). Nuts and bolts guide to rigging. Church Hill, MD: Mouse House Books, p.430
8. Dreher, J. (2002). Durham Boat Company - Rigging. Retrieved August 26, 2011, from <http://www.durhamboat.com/rigging.php>
9. Filter, K. B. (2009). The System Crew – Boat. (Vol. 2010).
10. Herberger, E., & al, et. (1977). Rowing Rudern The GDR text of oarsmanship (4th ed.). Berlin: Original by Sportverlag.
11. Howell, G. (1997). Australian Rigging manual and guidelines. Rowing Australia Inc.
12. Kleshnev V. (2001-11) Rowing Biomechanics Newsletter [www.biorow.com](http://www.biorow.com)
13. Nilsen T., Nolte V. (2002). FISA Basic Rigging from Be a Coach Handbook Level 1.
14. New Wave rowing shoe fixing system. <http://www.newwave.de/Rowing-Shoes-Fixing-System/NEW-WAVE-ROWING-SHOE-FIXING-SYSTEM.html>
15. Nolte V. (2004). Rigging. In: Rowing faster. Human Kinetics. 125-140
16. Nolte V. (2011). Using equipment more effectively. In: Rowing faster, 2<sup>nd</sup> edition. Human Kinetics. 125-144.
17. O'Neill, T. (2004). Basic Rigging Principles. Oarsport.
18. Redgrave, S. (1992). Stephen Redgrave's complete book of rowing. Partridge Press.
19. Rose D. (1992). Rowing Fundamentals for the United States Rowing Association. In Ferriss, J.A. (Ed.), .
20. Sayer B. (1996). Rowing and Sculling the complete manual. Robert Hale London.
21. Soper C., Hume P. (2004) Towards an Ideal Rowing Technique for Performance. Sports Med; 34 (12): 825-848
22. Thompson, P. (2005). Sculling Training, Technique & Performance. Wiltshire, UK.: Crowood Press.
23. Vespoli, M. (1992). Rowing Fundamentals. In J. A. Ferris (Ed.), (p. 273). USA: Heart of the Lakes Publishing, Interlaken, New York.

Thanks to Stephen Aitken for the help in compiling the literature references.