

2019

**world
rowing**[®] youth coaches
conference

Hangzhou, China

November 7th-November 10th, 2019

Rigging



The primary purpose of rigging is to provide the athlete with a comfortable work position from which the most effective power application to the boat by the oar can be performed.

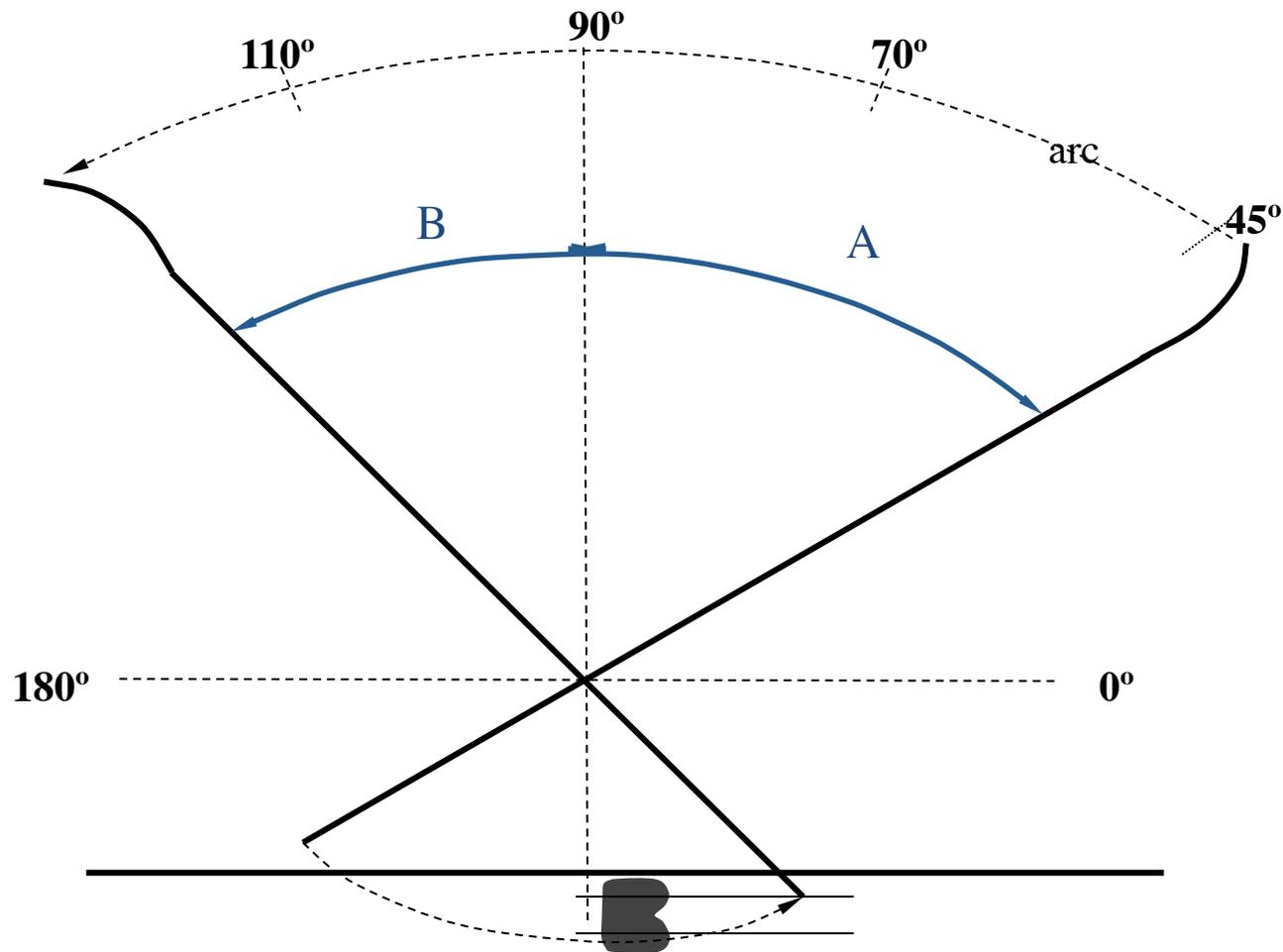
Although rigging partly determines technique, it should permit the execution of a technique with natural movements. This will enable the athlete to effectively apply power through an oar with a blade fully covered and traveling on a horizontal plane through the drive phase of the stroke cycle.



A well rigged boat will not win a race for you
however,
a badly rigged boat can lose a race for you.

Oars influence technique





	US Rowing	FISA	FIC
scull	90-105°	95-110°	107-112°
A/B	50-65°/40°	60-70°/45-35°	60°/47°
sweep	80-90°	85-90°	85-90°
A/B	45-55°/35°	50-55°/30-40°	50°/35°

Categories	Catch angle	Release Angle (deg)	Total Angle (deg)
Men scull	-66.5	43.8	110.4
Men light scull	-64.5	42.6	107.1
Men sweep	-56.8	34.3	91.2
Men light sweep	-54.3	33.6	87.9
Women scull	-62.2	43.0	105.2
Women light scull	-61.3	42.8	104.2
Women sweep	-53.5	33.4	86.9

V. Kleschnev 2005

Categories	Catch angle	Release Angle (deg)	Total Angle (deg)
Men scull	66.5	43.8	110.4
Men light scull			
Men sweep			
Men light sweep			
Women scull			
Women light scull			
Women sweep			

Table 1	Catch	Finish	Total
Men Sculling	70	44	114
Lightweight men sculling	66	44	110
Men Sweep	59	33	92
Lightweight men sweep	58	32	90
Women Sculling	66	44	110
Lightweight women sculling	63	43	106
Women Sweep	58	32	90

V. Kleschnev 2017

Arc Length and Catch & Finish Angles

The length of the stroke that an athlete rows is affected by several factors.

- Physical dimensions of the athlete
- Gearing Configuration
- Technical or style differences
- Crew considerations - matching arcs

Arc Length and Catch & Finish Angles

Generally

Faster boats → smaller finish/larger catch angle

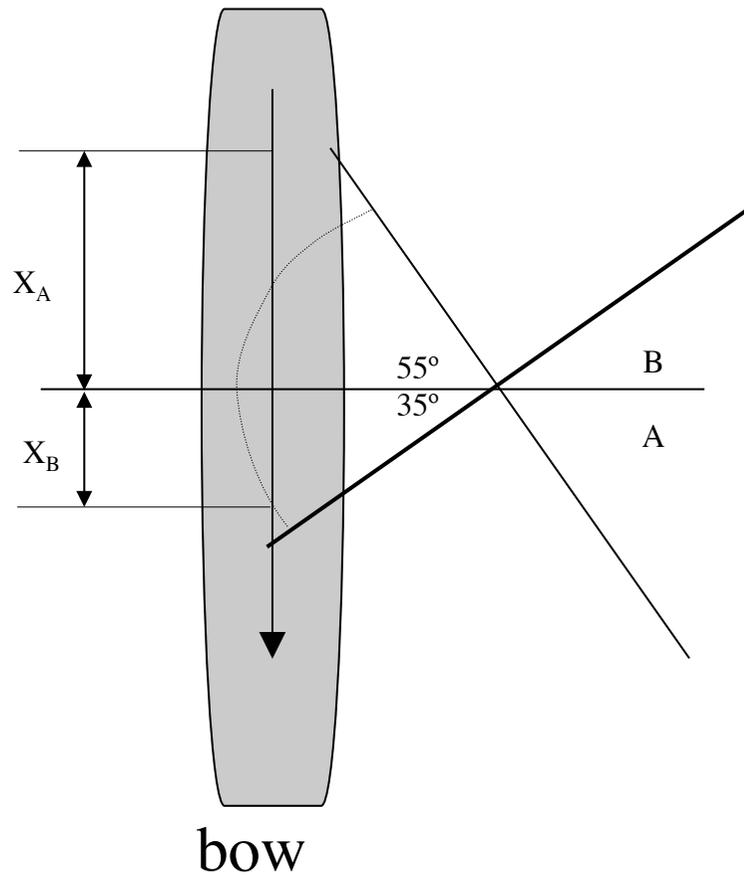
Slower boats → larger finish/smaller catch angle

Arc Length and Catch & Finish Angles

Positioning the athlete in the boat.

- First set the athletes finish position –
move footstretcher to achieve desired finish arc
according to marks in the boat (straws).
- Once finish position is set - analyse the catch angle.
- Important to match up the arcs of all athletes in crew.





How to fix correct arc and angles on washboard

$$X_1 = \text{tang. } \partial^\circ \times \text{span (cm.)}$$

$$X_A = \text{tang. } 55^\circ \times 85 \text{ (cm.)} = 121,4 \text{ cm.}$$

$$X_B = \text{tang. } 35^\circ \times 85 \text{ (cm.)} = 59,5 \text{ cm.}$$

	Arc Span (cm.)	Angle (°)	X (cm.)
A	87	50	103,7
	87	55	124,2
	87	60	150,7
B	87	30	50,2
	87	35	60,9
	87	40	73,0

A	86	50	102,5
	86	55	122,8
	86	60	149,0
B	86	30	49,7
	86	35	60,2
	86	40	72,2

A	85	50	101,3
	85	55	121,4
	85	60	147,2
B	85	30	49,1
	85	35	59,5
	85	40	71,3

A	84	50	100,1
	84	55	120,0
	84	60	145,5
B	84	30	48,5
	84	35	58,8
	84	40	70,5

A	83	50	98,9
	83	55	118,5
	83	60	143,8
B	83	30	47,9
	83	35	58,1
	83	40	69,6

	Arc Spread (cm.)	Angle (°)	X (cm.)
A	160	60	138,6
	160	65	171,6
	160	70	219,8
B	160	30	46,2
	160	35	56,0
	160	40	67,1

A	159	60	137,7
	159	65	170,5
	159	70	218,4
B	159	30	45,9
	159	35	55,7
	159	40	66,7

A	158	60	136,8
	158	65	169,4
	158	70	217,1
B	158	30	45,6
	158	35	55,3
	158	40	66,3

A	157	60	136,0
	157	65	168,3
	157	70	215,7
B	157	30	45,3
	157	35	55,0
	157	40	65,9

A	156	60	135,1
	156	65	167,3
	156	70	214,3
B	156	30	45,0
	156	35	54,6
	156	40	65,4

Arc Length and Catch & Finish Angles

Body Position

Finish Position

good trunk stability - flat low back

outside hand/knuckles under lower ribs

legs held down

looks strong but comfortable

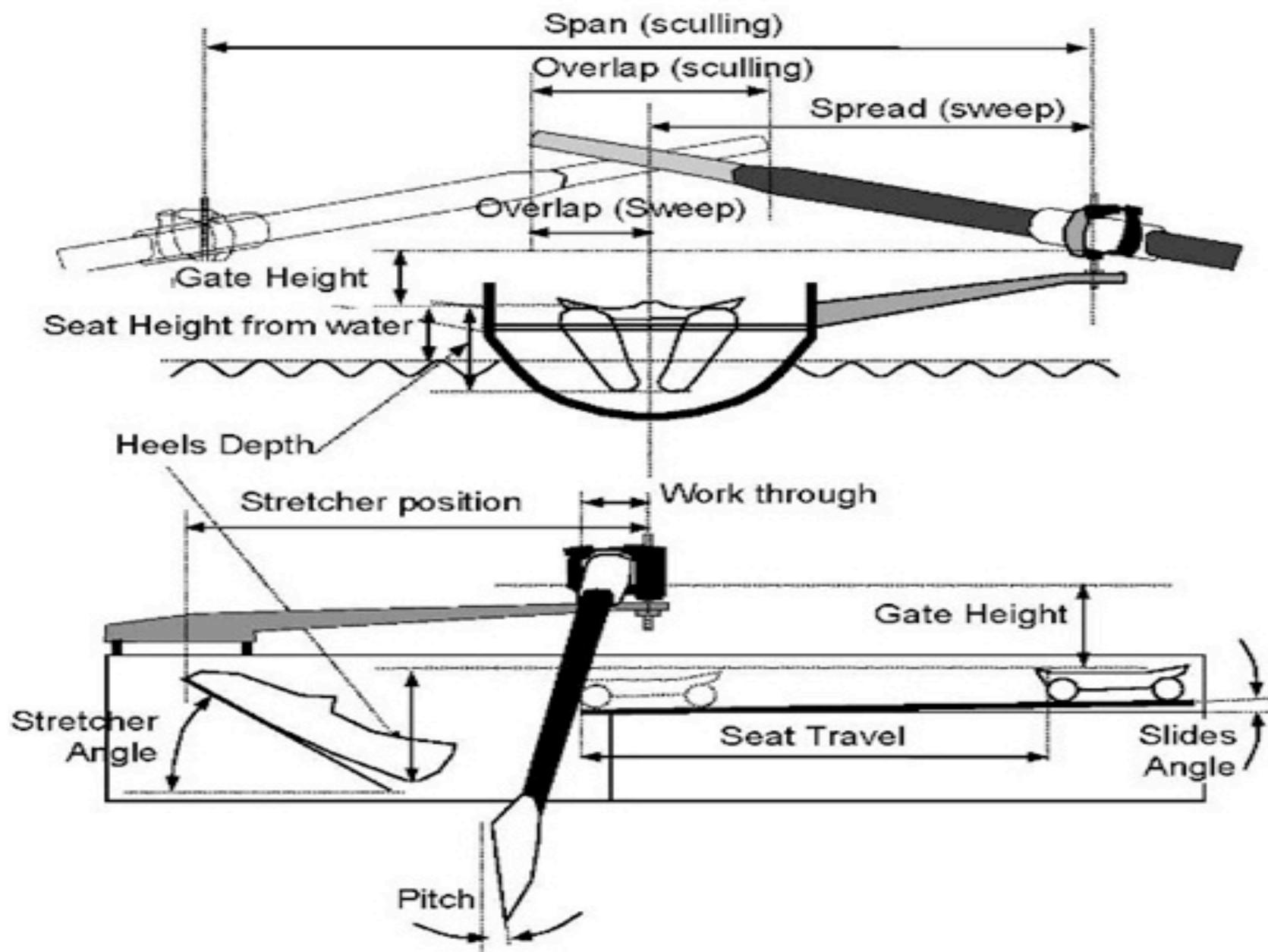
Catch Position

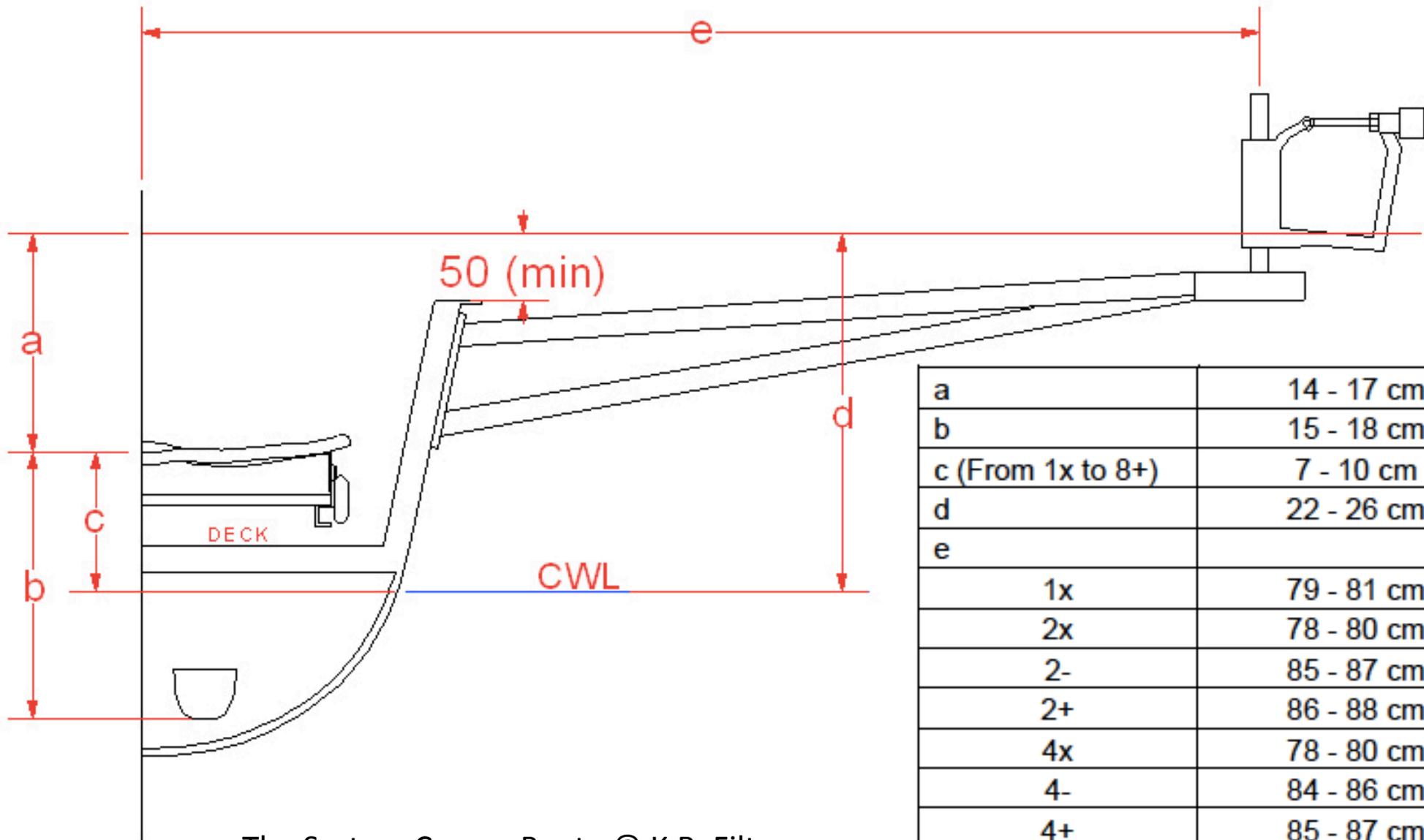
avoid excessive over reaching

good trunk stability

shins vertical

- Do not forsake correct body position and strength to achieve desired arc.



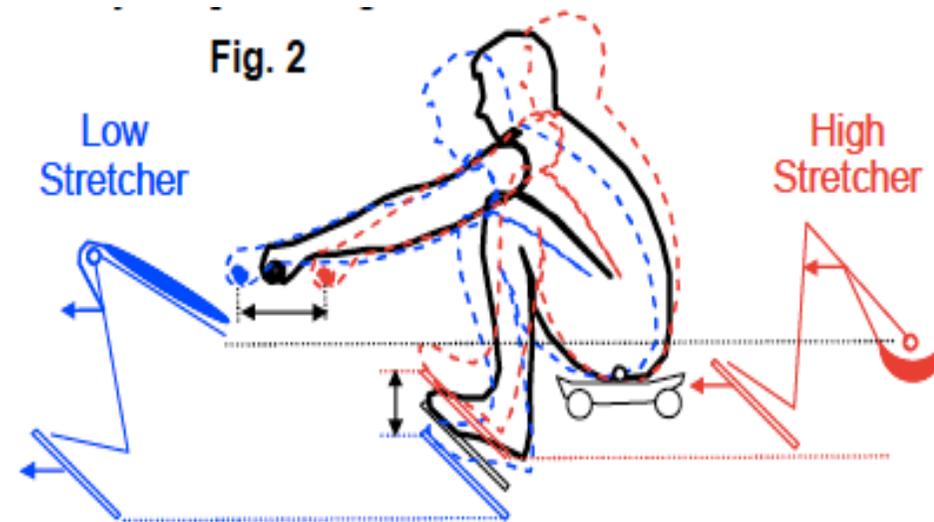
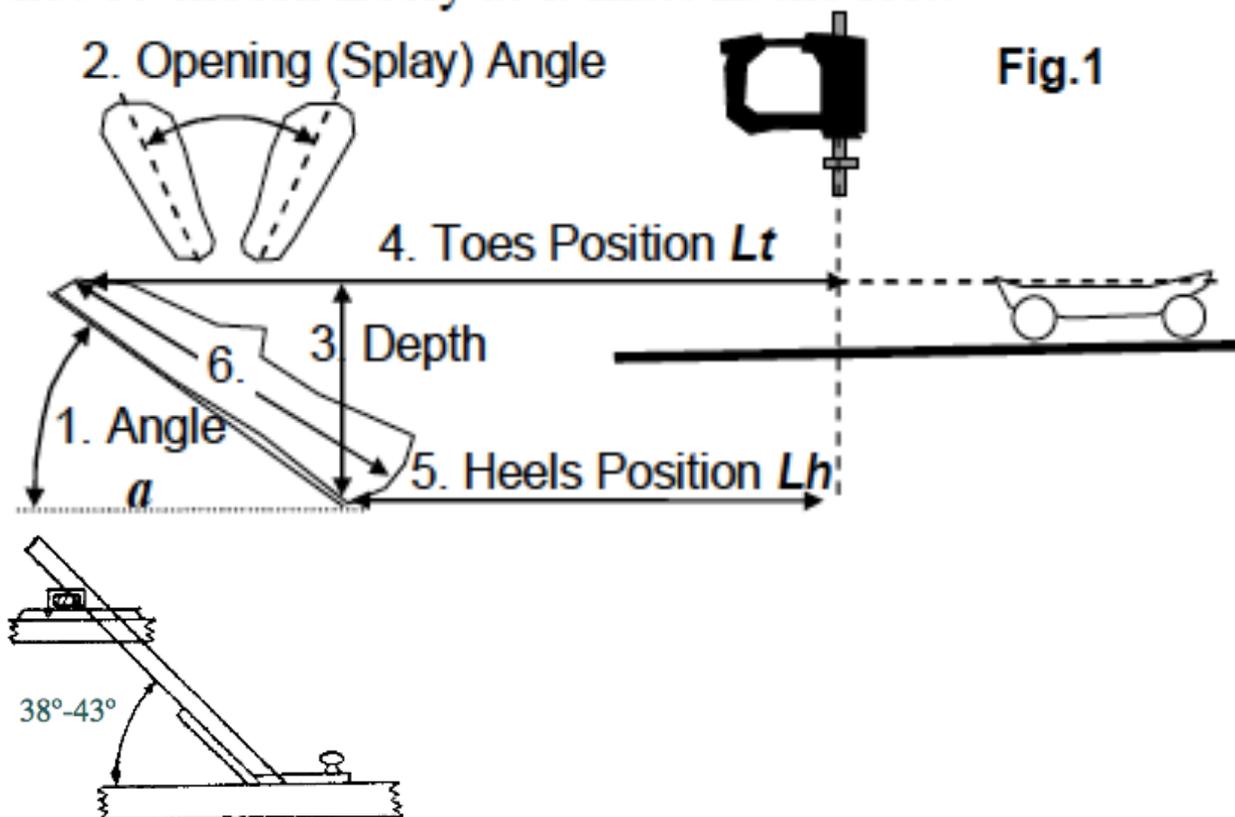


a	14 - 17 cm
b	15 - 18 cm
c (From 1x to 8+)	7 - 10 cm
d	22 - 26 cm
e	
1x	79 - 81 cm
2x	78 - 80 cm
2-	85 - 87 cm
2+	86 - 88 cm
4x	78 - 80 cm
4-	84 - 86 cm
4+	85 - 87 cm
8+	83 - 85 cm

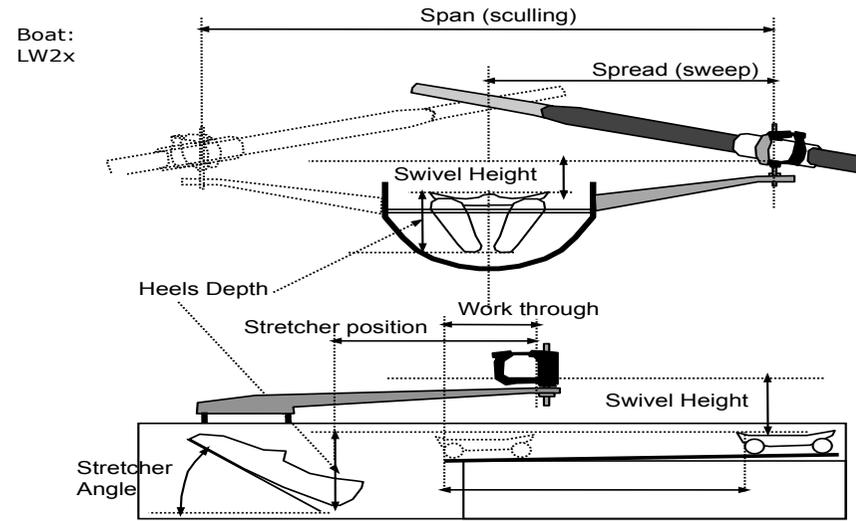
The System Crew – Boat - © K.B. Filter

Footstretcher

(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.



Individual Rigging Chart



	Stroke Chen	Bow Sharone
Oars		
overall length	286 cm	286/287 cm
Inboard	88,5 cm	88,5/89 cm
Blade type	CII Vortex	CII Vortex
Span / Spread	158,1 cm	159,8 cm
Starboard	79,1 cm	79,5 cm
Boardside	79 cm	80,3 cm
Footstretcher		
heels/pin line	34 cm	33 cm
heels depth	13 cm	15 cm
stretcher angle	43 °	43 °
Swivel height		
Starboard	18,5 cm	14 cm
Boardside	17 cm	12,2 cm
Pitch on blade		
Starboard	18-16 mm	18-16 mm
Boardside	18-16 mm	18-16 mm
Slides		
Work trough	10 cm	10 cm
overall length	80 cm	80 cm

General Considerations

- **Before you start:**
 - Individual Rigging
 - Rigging for weather conditions
 - Latest Equipment
 - Recording Rigging Data

General Considerations

Control always the vertical position of the pin, check the pitch at catch, perpendicular and release position. Check at the blade, because not all oars have really the same pitch at the sleeve.

The higher the swivels are rigged over the waterline and seat the less the pitch can be. Big blades need because of their asymmetric shape generally less pitch than Macon blades.

The System Crew – Boat - © K.B. Filter

General Considerations

It is to recommend using lower decking and rails and higher seats to enable the rowers to stretch their legs better during the stroke. To bring just the stretcher higher reduces the arc of the oar at the catch; even the stretcher has the right length position. Consider that most of the roller bearing seats are built lower than the double action seats and that makes this problem more crucial.

In the search for better solutions never change several measures at the same time, except measures that are interdependable. One will never know what is the reason for these different results.

The System Crew – Boat - © K.B. Filter

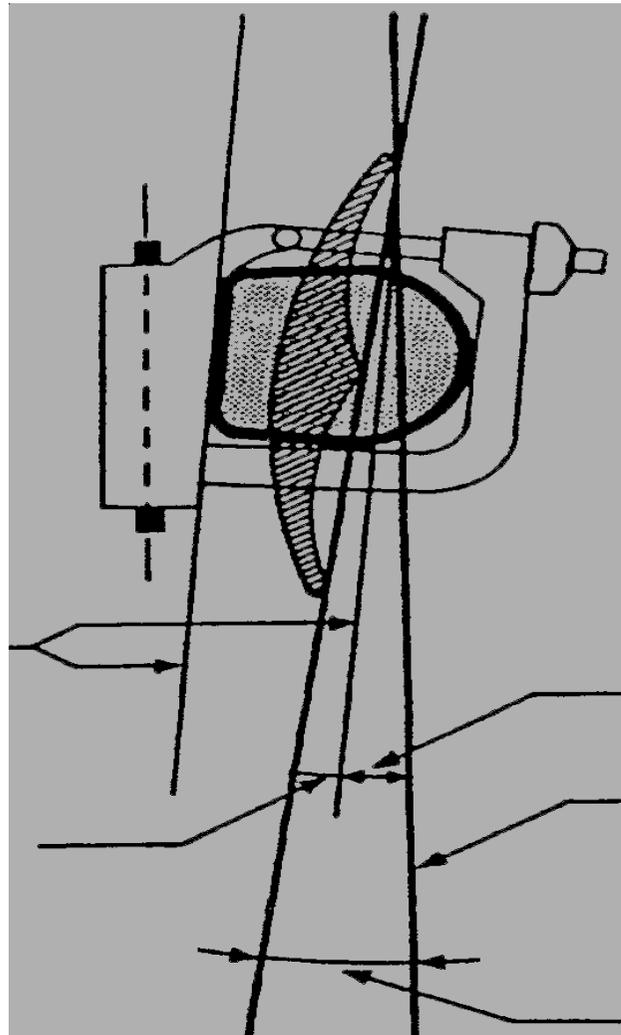
General Considerations

The final goal of any kind of individual adaptation, especially in crew boats, is to achieve the same stroke length with the same arcs at the catch and the release, with an exactly corresponding timing.

Many coaches want to achieve that with the same measures of spread, span and oars even some of the athletes have different biomechanical conditions.

Do not hesitate to give certain athlete less span and shorter inside levers, if needed. When he has qualified for a top crew under his lack of biomechanical conditions he must be very powerful and with the changed rig he is able to row in the same relaxed way like the other crew members.

Pitch on the blade



Oarlock
(swivel)

Oar
(blade)

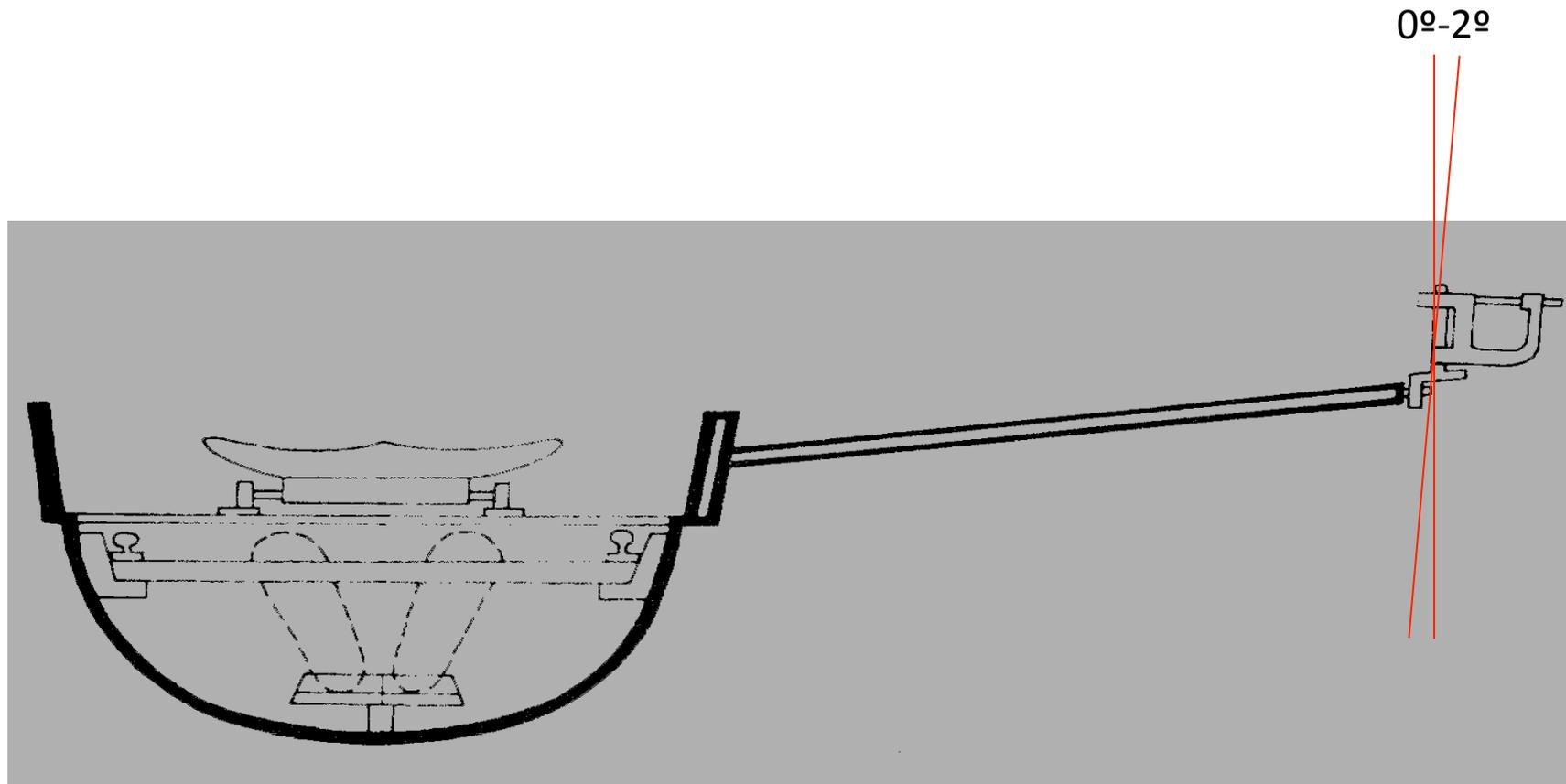
Oarlock (swivel)

Vertical 0°

Total Pitch: 2° - 8°

$$\begin{aligned} \text{Total pitch} \\ = \\ \text{Pitch on Swivel} \\ + \\ \text{Pitch on Oar} \end{aligned}$$

Lateral pitch



How measure the pitch



1. Place the oar perpendicular to the boat and hold it at a level comparable to its depth in the water.
2. Place a weighted string over the top of the blade, at a point 10 cm from the tip of the blade and allow it to hang in front of the blade until stable.
3. Measure the horizontal distance between the bottom edge of the blade and the hanging string.

General Table

	Catch position	Finish position
Sweep		
Big Blade (25cm.)	21mm.(= 5°)	18mm.(= 4°)
Macón (20-21cm.)	21mm.(= 6°)	18mm.(= 5°)
Scull		
Big Blade (21cm.)	18mm.(= 5°)	15mm.(= 4°)
Macón (17-19cm.)	18-20mm.(= 6°)	15-17mm.(= 5°)

General Table

	Catch position	Finish position
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Need to be reivised!!!

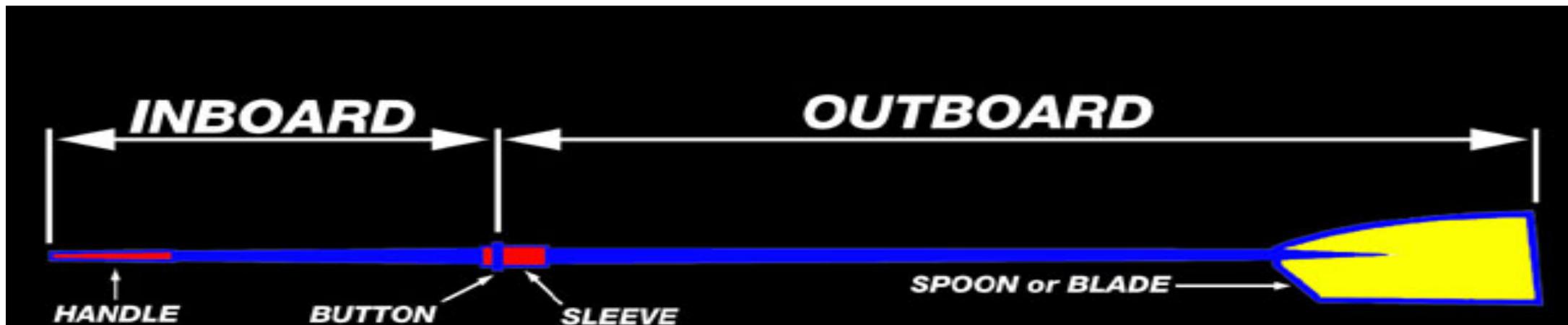
Tables de measurements

Senior men	Span / Spread	inboard	Oar lenght BB	Oar length Macón	overlap
1x	158-162	87-88	287-291	298-300	18-22
2x	156-160	86-89	287-291	298-300	18-22
4x	156-160	86-89	287-291	298-300	18-22
2+	87 ±1	117 ± 1	375-378	382-385	30-32
2-	88-85	117-114	372-378	382-385	30-32
4+	85 ±1	115 ± 1	375-379	382-385	30-32
4-	86-83	115-113	372-379	382-385	30-32
8+	85-82	114-112	374-379	382-385	30-32

Tables de measurements

female	Span / Spread	inboard	Oar length BB	Oar length Macón	overlap
1x	159	88	284-290	296-298	18-22
2x	158	87	284-290	298-300	18-22
4x	158	87	284-290	298-300	18-22
2-	86	116	366-372	374-380	30-32
4-	85	115	368-372	375-381	30-32
8+	84	114	370-374	376-382	30-32

Gearing Ratio



Ratio = outboard / inboard

General Considerations

when selecting Gearing Ratios

1. Length of the race
2. Course conditions
3. Fitness and strength of crew
4. Crews optimum rating
5. Crews optimum stroke length

With higher boat speed class

- higher gear ratio
- smaller spread
- longer outboard

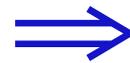
Lower Ratios for sculling boats

Gearing Ratios

↑ Oar Length

↑ Inboard

↑ Spread / Span



↑ Gearing Ratio

↓ Gearing Ratio

↓ Gearing Ratio

FISA GEARING

Formula: (outboard -2) / (half span/spread)

p.e. Span 158cm (scull)

Oar length 288 / inboard 88

$$200-2 / 79 = \mathbf{2,50}$$

WRJC 2011 Rigging Survey

August 2011 Dorney Lake

Analysis of data

24th November 2011

Key findings

Juniors compared with Adults (WRJC 2011 cf. WRC 2006)

- Juniors gearing averages 1% lower than adults (3% in W4x)
- Juniors boat velocity averages 5% less than adults
- Juniors hand-foot velocity averages 4% slower (7% in W2x, 1% in M8x)
- JM ave. boat velocity has same relative % ergo scores, JW 2% slower

Gearing

- Within sweep or scull classes gearing is only changed by 1-3% although class speed differences vary **by up to 25%**
- Sculls: faster crews used lighter gearing all classes except M1x
- Sweep: faster crews used lighter gearing only in M2-, M4+ and M8+

Hand – foot velocities (muscle velocities)

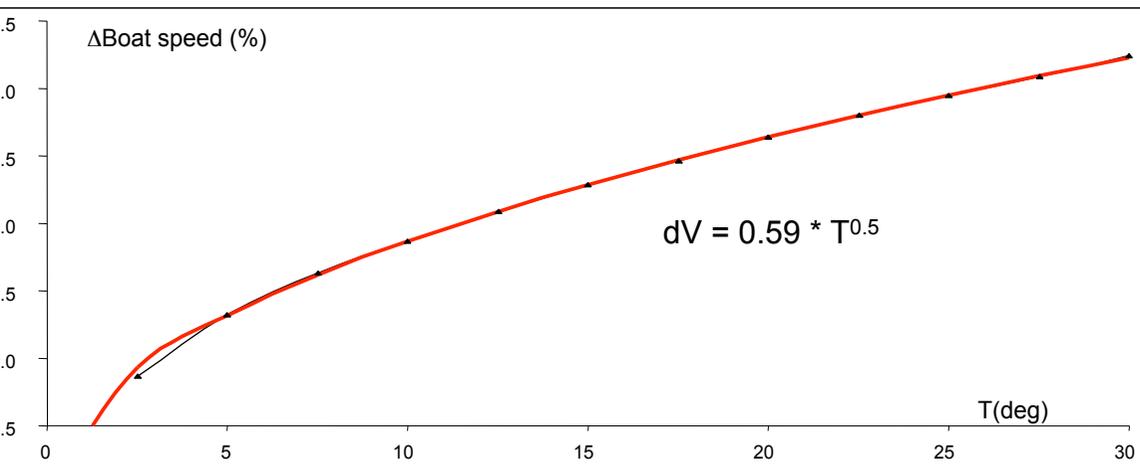
- All classes: faster crews had higher hand – foot velocities all classes
- Only in M4x is hand – foot velocity the same as M8+,
in other classes it is up to 24% slower

Measurements for kids**

	<i>oar length</i>	<i>Inboard</i>	<i>blade size</i>
Scull			
<14 :	285 cm.	85 cm.	15 cm.
<16 :	294 - 296 cm.	86 cm.	16 cm.
Sweep			
<16 :	380 - 382 cm.	114 - 116 cm.	19,5 cm.

** Macón blade

Influence of the weather conditions (Filter K. 1990)

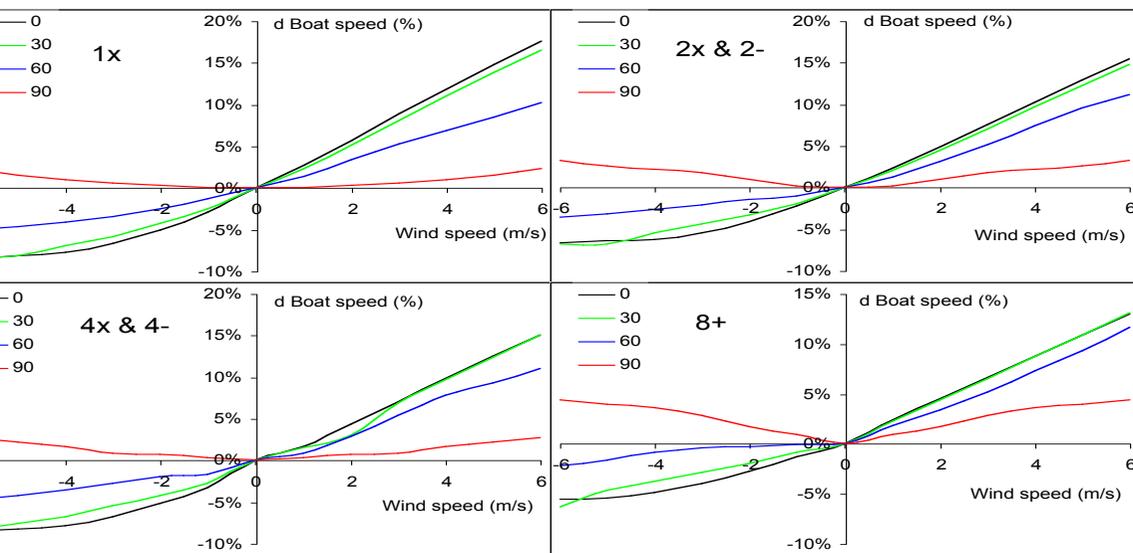


Water temperature:

- Around 2.5% decreasing of the boat speed from 25°C down to 4°C;

Wind speed:

- Around two times less increase of the boat speed at tail wind than decrease at head wind;
- Cross wind affect crew boat more than singles.



Useful links

- <http://www.worldrowing.com/training/coaching-information-training-manuals>
- www.biorow.com/RigChart.aspx
- <http://highperformancerowing.net/>

2019

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**THANK YOU
for your attention**

