

Women and diving

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According to diving physician and green beret, Lt Col R Kelly Hill, MD.

“The only difference between men and women divers is that during pregnancy women should not dive – everything else is trivia and misinformation.”

History of female divers

- Amas
- Sports divers after WW2, Simone Cousteau, Lottie Haas
- Scientific divers 1960 - , Valerie Taylor, Eugenie Clark
- Military, 1973, Kati Garner US Navy
- Increase in popularity in Scandinavia after 1990



Important problems in the past

- Finding well fitting face masks
(Leaks at the side of the mask)
- Scuba cylinders generally too large
(Last longer than male buddy)
- Buoyancy compensators too large
(Give excessive drag)
- Fins too large
(Easy to lose, hard to swim)
- Ill fitting wet suits
(Thermal discomfort)



Factors of importance

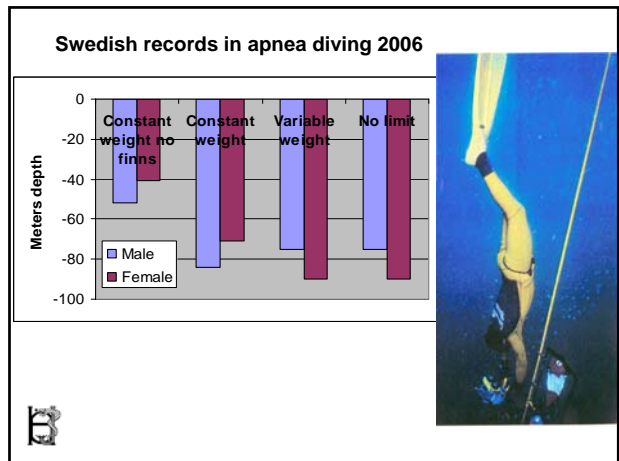
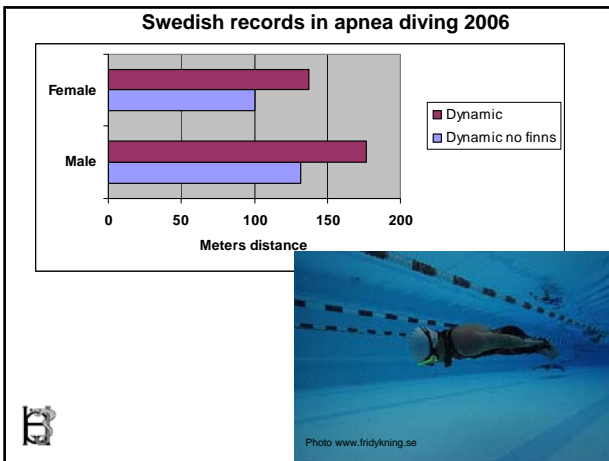
- Body dimensions and muscular force
- Mental factors
- Subcutaneous fat and body composition
- Hormones and menstruation
- Pregnancy



Comparisons male – female. (Young americans) (Sarah Nunnely, UHMS workshop Women in diving, 1987)

	Men	Women	Women/Men
Height (cm)	172	162	0.94
Weight (kg)	67	55	0.82
Relative surface area (cm ² /kg)	269	282	1.04
Lean body mass (weight-body fat)	57	40	0.70
Fat content (%)	15	27	1.80
VO ₂ max (L/min)	2.7	1.7	0.63
VO ₂ max (L/min/kg)	40	30	0.75





Här är världens djupaste kvinna

Examples of an article in the Swedish tabloid press and some photos of Audrey Mestre who died during an attempt to dive to 170 m in March 2003.

Hon testar gränserna p

30 meter under ytan vaknar Hanlis tävlingsinstinkt

Hormones

- **Menstruation:**
No problem in diving if no problems at land.
But -
A tendency for more diving related trouble during dives in the first week of the menstrual cycle
- **Oral contraceptives:**
If affecting coagulation they might become a problem in DCI

Decompression illness

	Women	Men
Venous bubbles on decompression		
Desola and Masurel	Less	More
Fife	Less	More
DCI in bounce diving		
Fife	More	Less
Bangasser	More	Less
Zwingleberg, US Navy	The same	The same
Hagberg & Ornhagen	The same	The same
St Leger Dowse	Less	More
DCI in altitude exposure		
Basset	More	Less

One explanation for higher incidence in females has been that females are more prone to report

Accidents in connection to diving among Swedish diving instructors and dive masters 1999

(In % of total number self reported accidents. Male 2207 and female 390)

Type of accident	Women	Order	Men	Order
Ear	12 %	1	9 %	3
Sinus	9 %	2	8 %	5
Seasickness	8 %	3	7 %	6
Strain	7 %	4	12 %	1
Deco. illness	6 %	5	11 %	2
Tooth	5 %	6	5 %	9
Cutting	5 %	7	8 %	4



Incidence of self-reported symptoms of decompression illness among Swedish sportsdiving instructors and dive masters 1999

- Male 1.52 per 1000 dives
- Females 1,27 per 1000 dives
(No statistically significant difference)

This is approximately 10 times higher than the incidence of DCI treated in recompression chambers



Consultations regarding DS at Swedish hospitals



Number of consultations

Year	Total	Female	% female
2005	84	20	24
2006	88	14	16

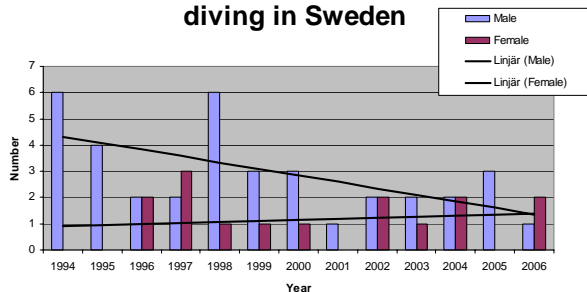


Data regarding incidents / accidents in sports diving SSDF

Year	Number of reports		
	Total	Female	% female
1994	97	20	21
2000	47	10	21
2001	68	15	22
2002	49	14	29
2003	58	15	26
2005	17	4	24



Fatal accidents in recreational diving in Sweden



Risks to the pregnant woman

(Ed Lanphier, 1987)

- Morning sickness
- Reduced ventilatory capacity
- Impaired peripheral circulation
- Altered sympathetic response
- Reduced fitness
- Ill fitting equipment
- Fluid retention and increased risk for DCI
- Swollen mucosal membranes and problems with ear clearing



Potential risks to the fetus

- Teratogenic effects of high nitrogen and oxygen pressures
- Embolization of the fetal circulation
- Vascular constriction due to high oxygen partial pressures
- Hypoxia during shallow water black-out



Human data on "Birth defects"

- Amas (breath holding femal divers from Korea and Japan)
Tend to deliver early, and small, but healthy children
- Bangasser, 1977: No problems (Small sample)
- Bolton, 1980: Some problems (Small sample)
- Bakkevig, 1989: Some problems (Small sample)

All three studies are retrospective and with small number of answers.
Today very few pregnant women dive and it is impossible to do a new and "better" study.



Conclusions from an UHMS workshop 1988. (Ed Lanphier ed)

- Diving can increase the risk of birth defects
- Fetal resistance to bubble formation (DCI) is offset by the dire consequences of this.
- Maternal DCI late in pregnancy entails a higher risk of stillbirth. Recompression increases this.



Tack

The one in red must be the female. Or....

