

ANALYSIS OF RECREATIONAL DIVING TRAINING ACCORDING TO THE CMAS INTERNATIONAL DIVING CONFEDERATIONS, SSI DIVING SCHOOL SYSTEM AND AMERICAN NAUI AND PADI ASSOCIATIONS

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Abstract: The article describes and compares various methods of obtaining basic diving licences on the example of CMAS international diving confederations, the SSI diving school system and two American diving associations, NAUI and PADI. According to Divers Alert Network Europe, 189 fatalities related to diving occurred in 2018, most of which may have been prevented by sufficient training. The article describes what prerequisites must be met in order to obtain the basic qualifications to practice recreational diving in each of the above-mentioned diving organisations. Therefore, the article compares various training processes for a recreational scuba diver implemented in four selected organisations.

Keywords: recreational diving, diving courses, safe diving.

1. INTRODUCTION

There are many diving organisations and/or confederations in the world that allow a person to obtain various qualifications for recreational diving. There are also many diving associations associating professional divers and military divers, e.g., special forces operating in Poland, the 'Foki' of the Polish Navy, or special forces of the US Navy Sea, Air and Land, such as the specialist UDT (Underwater Demolition Team) for special tasks and underwater diversion. In this article, due to its limited nature, as members of the Student Special Interest Group of Underwater Research 'Sea Quest', we will focus mainly on civilian organisations, in particular the four most popular international diving organisations:

- CMAS – (from the French: Confédération Mondiale des Activités Subaquatiques), World Confederation of Underwater Activities;

- SSI – Scuba Schools International;
- PADI – Professional Association of Diving Instructors;
- NAUI – National Association of Underwater Instructors.

When acquiring qualifications in the above-mentioned diving organisations, everyone should be guided by the basic elements of diving, such as:

- knowledge: The student gains knowledge during theoretical classes with the help of an instructor and independently, getting acquainted with the theoretical materials provided by a given organisation. Knowledge enables safe and responsible behaviour underwater and provides information about the aquatic environment;
- skills: The goal of all diving courses in the given organisations is to achieve a level of skills that will allow comfortable and instinctive movement in the water at each level of diving development;
- experience: Participation in diving expeditions allows the participants to gain experience while reaching the next diving levels;
- respect for marine flora and fauna: No interference with the natural ecosystem in water bodies and reservoirs shows respect for the marine environment in which divers spend a lot of time.

Divers Alert Network (DAN) provides Annual Diving Reports which contain data about the number of diving fatalities, injuries and incidents.

Table 1. Total number of collected fatalities, emergency cases and information requests worldwide for years 2014–2018

| Year | Fatalities | Cases* | Inquiries** |
|------|------------|--------|-------------|
| 2014 | 146 | 3,169 | 6,361 |
| 2015 | 127 | 3,593 | 6,373 |
| 2016 | 169 | 3,593 | 7,094 |
| 2017 | 228 | 3,809 | 6,727 |
| 2018 | 189 | 3,127 | 6,635 |

Source: F. Tillmans, Annual Diving Report 2020, P.J. Denoble, Annual Diving Report 2019, P. Buzzacott, Annual Diving Report 2016, 2017, 2018.

* Cases – Initial inbound contact for emergency medical and travel assistance, related or not to diving.

** Inquiries – Initial inbound contact for nonemergency medical information, mostly related to travel and diving.

Most diving accidents occur due to poor preparation and organisation of diving expeditions, lack of proper maintenance of the diving equipment and recklessness underwater. To minimise the number of diving incidents, sufficient training should be provided by professional training associations.

2. DIVING TRAINING ACCORDING TO CMAS INTERNATIONAL DIVING CONFEDERATIONS

In Poland, the CMAS confederation is represented by the Underwater Activities Commission (KDP) based in Warsaw. KDP is a statutory body of the Polish Tourist and Sightseeing Society (PTTK). As a national federation, it is a member of CMAS and thanks to this, divers trained under KDP receive international CMAS diving certificates.

2.1. Basic diving training

The basic diving course in the CMAS organisation is One Star Diver. The course participant gains techniques to dive to a depth of 20 metres. The One Star Diver training includes 13 hours of theoretical lectures. To participate in the training, the student must be over 14 years old and have sufficient swimming skills, which are assessed by the instructor. Participant will also need a doctor's statement on the absence of health contraindications for scuba diving or a health statement. The practical part of the course includes a minimum of 20 hours of open water sessions over 5 training days and 9 dives, with a total stay underwater of at least 200 minutes.

The cost of the One Star Diver basic diving course at the official KDP CMAS Active Divers Centre in Olsztyn is 2,290 PLN (data from November 2022).

The costs of such a course include:

- One Star Diver's manual;
- full diving equipment for the duration of the course;
- 20 hours of open water classes included over 5 days of training;
- 13 hours of theoretical lectures;
- 9 diving sessions.

In addition, trainees can apply for a personal diver's book, a list of dives and an international plastic ID. The fee for issuing the documents is 399 PLN (as of November 2022).

2.2. Higher diving training

Continuation of a certified diving career in the CMAS organisation, after receiving the One Star Diver qualification, is joining the Two Star Diver course. However, to start the course, trainees must be at least 16 years old and have obtained the following specialty degrees:

- Night Diver;
- Underwater Navigation;
- Underwater Explorer or other equivalent organisations.

Moreover, 30 logged dives (including training dives) are required, including at least 10 dives deeper than 15 metres. The price of the Two Star Diver course starts from 2,490 PLN (data from November 2022).

The Two Star Diver training consists of 10 open water dives, including 7 dives to a depth of 20 metres, one dive to a depth of 30 metres and two dives to a depth of 40 metres.

A CMAS Two Star Diver has the right to dive to a depth of 40 metres in a group with divers with equivalent or higher qualifications. For the training to be valid, a fee is required for entry in the diver's book and an international plastic certificate, at the price of 199 PLN (as of November 2022).

The final stage of the CMAS recreational scuba training is joining the CMAS Three Star Diver training. Before starting the course, trainees must pass a physical test, which consists of two stages:

- swimming in full diving equipment for a distance of 1,500 m on the surface in less than 60 minutes;
- immersion while holding the breath in basic equipment (ABC) to a minimum depth of 10 metres.

After completing the physical test, the student can start the course. It consists of theoretical lectures lasting 19 hours, and 35 hours of practical sessions, which should be carried out within a minimum of 7 training days. The next stage of the course is diving (at least 10 times), with a total time underwater of not less than 360 minutes. The entire course may not exceed two months. For the trainee to be able to join the training, it is required that he or she is over 18 years old and has the following specialist degrees:

- Nitrox Diver;
- Dry Suit;
- Side mount Diver.

In addition, it is required to have one of the selected medical titles (medical doctor, paramedic, qualified first aid rescuer) or to complete the medical part of a course in pathophysiology including the first aid variant.

Participant must also complete 40 practice dives after obtaining the CMAS Two Star Diver degree, including at least 10 in the depth range of 30–40 metres.

After completing the training, the trainee is authorised to organise and conduct diving trips in the country and abroad. He or she has the skills to dive to a depth of 50 metres using air as the bottom gas with a partner who is at least CMAS Three Star Diver Qualified. In addition, a graduate of the course may lead a team of divers with One, Two, or Three Star degrees (or equivalent qualifications of other organisations) underwater in the scope of depths appropriate for these degrees and participate in the training process under the direct supervision of an instructor.

The price of the CMAS Three Star Diver course starts from 2,890 PLN (data from November 2022).

For the training to be valid, a fee is required for entry in the diver's book and for obtaining an international plastic certificate at the price of 199 PLN.

2.3. Speciality dive courses

The CMAS organisation offers several specialisations:

- Dry Suit;
- Ice Diving;
- Wreck Diver;
- Nitrox Diver;
- Advanced Nitrox Diver;
- Cavern Diver.

3. DIVING PROGRAMS AVAILABLE IN THE SSI SYSTEM

Scuba Schools International (SSI) – is an organisation founded in 1970 to spread the teaching of safe diving. It is one of the world's largest professional training agencies, with more than 3,500 training centres in more than 150 countries around the world.

3.1. Basic diving training

Requirements for beginning a diving course:

- Complete a water fitness evaluation;
- Familiarisation with Digital Training Materials;
- Completion of SSI Training Documentation:
 - Responsible Diver Code,
 - Diver Medical Statement & Questionnaire or Physician's Approval to Dive,
 - Program-specific Completion Record (done by the instructor before certification).

SSI's first program is the Open Water Diver (OWD). The course consists of six theory classes, six pool (or limited water) sessions and four open water training dives. The minimum age required to participate in the training is 10 years (Junior OWD) / 15 years. The maximum depth during training is 18 metres. For those who have not reached 15 years of age (Junior OWD), the maximum dive depth is 12 m. Obtaining the OWD certificate entitles the participant to dive with a partner at the maximum depths in which the training was held (max. 12 m/18 m).

The cost of the basic OWD course at the authorised SSI training centre, TICADA Dive and Active Tourism Center, is 2,000 PLN (as of November 2022), which includes:

- Complete diving equipment for the duration of the course;
- Training materials downloadable through the MySSI app;
- Pool entries;
- Base fee;
- A CD with souvenir photos of the course, including underwater photos;
- DAN insurance for the duration of the training;
- International certificate in a mobile version.

3.2. Higher diving training

One way to continue your diving career with the SSI organisation is to take the Advanced Adventurer diver program. The prerequisites are an OWD SSI /OWD Junior SSI certificate (or equivalent from another organisation). It consists of five theoretical classes and five open water dives, during which the student is introduced to five selected specialities.

The minimum age to participate in the training is 10 years. Depending on the age, the maximum dive depth is differentiated:

- 10–11 years – 12 metres;
- 12–14 years – 18 metres;
- 15 years and older – 30 metres.

Obtaining the Advanced Adventurer Diver certificate allows the participant to dive with a partner to the maximum depth of the training course (maximum 30 metres) and offers the opportunity to participate in all specialities.

The Advanced Adventurer Diver course is offered by the SSI training centre of the TICADA Dive and Active Tourism Center, and its cost is 1,000 PLN (as of November 2022).

Another way of developing with the SSI is to directly participate in speciality programs.

Achieving successive levels of education and experience in recreational diving, by taking speciality courses, allows the participant to earn further training recognition degrees in the ISS organisation, such as:

- Speciality Diver – 2 specialities and 12 logged open water dives;
- Advanced Open Water Diver (SSI AOWD) – 4 specialisations and 24 logged open water dives;
- Master Diver – 4 specialisations, Diver Stress and Rescue specialisation and 50 logged dives in open water.

3.3. Speciality dive courses

The SSI organisation offers several interesting speciality programs, among them, those recommended are:

- Deep Diving;
- Diver Stress and Rescue;
- Enriched Air Nitrox;
- Navigation;
- Night and Limited Visibility;
- React Right.

4. DIVING PROGRAMS AVAILABLE IN THE PADI SYSTEM

The professional association of diving instructors (PADI) is one of the largest international diving organisations. Padi operates in 186 countries, with 6,600 dive centres and more than 128,000 professional members.

4.1. Basic diving training

Initial requirements to start a diving course in the PADI organisation:

- completion of medical statement;
- basic swimming skills;
- knowledge of the training materials.

The basic diving program in the PADI organisation is Open Water Diver PADI (OWD). OWD training consists of five theory classes, five pool sessions and four open water dives. The minimum age of the trainee is 10 years old (recommended 15 years old). Such a student can obtain the rank of PADI OWD Junior Diver.

Earning the PADI OWD certificate entitles the trainee to dive to depths of up to 18 metres with a partner holding at least the same PADI OWD diving certificate. Persons under 15 years of age receive a Junior OWD certificate after completing the OWD course, which entitles them to dive to a maximum depth of 12 m with a diving instructor or parent holding at least the same PADI OWD diving certificate.

The cost of the basic OWD diving course at the official PADI Gdynia Dive Centre is 1,950 PLN (as of November 2022). The cost of such a course includes:

- full diving equipment rental for the duration of the course;
- a complete set of learning materials;
- 5 theoretical sessions, including a set of follow-up tests and a theoretical exam;
- a series of pool sessions;
- 4 open water dives (2 days);
- NWW insurance concerning Personal Accident and High-Risk Sports SWR;
- sessions in small groups of up to 4 people per instructor.

In addition, after completing the course, 200 PLN has to be paid for the issuance of an online certificate, available on the PADI App mobile application.

4.2. Higher diving training

The most common way to advance your diving career in the PADI organisation, after earning your OWD certification, is to take PADI's Advanced Open Water Diver (AOWD) course. AOWD training consists of 5 dives, one dive each for the speciality of deep diving and navigation diving. The remaining 3 dives consist of specialisations chosen by the trainee. After the completed open water dives, 5 knowledge tests on two mandatory specialisations and three selected specialisations must be passed.

To participate in the PADI AOWD course, the participant must be at least 12 years old (recommended 15 years old) – Junior AOWD – and have a PADI OWD certificate or an equivalent diving degree issued by another recognised diving organisation.

Depending on the age of the trainee, the acquired qualification for maximum depths during dives varies. From the age of 12 to 14, a student can dive to a maximum of 21 metres, as they receive Junior AOWD certification. Upon reaching the age of 15, they automatically receive a full AOWD certificate, authorising them to dive to a maximum depth of 30 metres. In addition, the holder of the AOWD certificate is entitled to participate in all PADI diving specialisations and the Rescue Diver course.

The AOWD PADI course can be taken by the student at the official PADI Gdynia Dive Center for 1,400 PLN (as of November 2022).

The next-in-line course, after the PADI AOWD certification, is the PADI Rescue Diver. This training focuses on learning how to deal with problems as they occur, increasing the chances of avoiding an accident. To take the course, trainees must be at least 12 years old (Junior Rescue Diver) / 15 years of age and hold an AOWD or equivalent diving degree from another recognised diving organisation. Those who are under 15 years of age will be certified as a Junior Rescue Diver upon passing the training course, which automatically becomes a Rescue Diver certification upon reaching 15 years of age.

In terms of recreational diving, the highest PADI diving certificate is the PADI Master Scuba Diver (PADI Master Scuba Diver), which is a rating. To earn the PADI Master Scuba Diver rating, one must be certified in AOWD, Rescue Diver and five selected PADI Specialty Diver programs, plus the trainee should have a minimum of 50 logged dives.

4.3. Speciality dive courses

The PADI organisation offers a wide range of specialised courses to achieve the rank of PADI Master Scuba Diver, of which the following are recommended:

- PADI Deep Diver;
- PADI Dry Suit Diver;

- PADI Nitrox Diver;
- PADI Underwater Navigation;
- PADI Night Diver;
- PADI Underwater Photography.

5. DIVING TRAINING AVAILABLE IN THE NAUI SYSTEM

The National Association of Underwater Instructors is a non-profit global educational association whose goal is to promote safe diving through education.

5.1. Basic diving training

The basic diving course in the NAUI organisation is SD – Scuba Diver. The training consists of five to six classes in pool waters and 5 diving sessions in open waters. The minimum age of a student for the Junior Diver degree is 10 years old, while trainees can become a full-fledged NAUI SD diver from the age of 15.

Passing the course and receiving the Scuba Diver certificate entitles the student to dive in the partner system in open waters without supervision to a depth of 18 m, provided that he or she dives no deeper than during the course and in similar conditions. For SD Junior, the trainee has the right to go underwater to a depth of 12 m only in tandem with an adult authorised to dive.

The cost of the basic NAUI SD diving course at the scuba diving training centre in Skawina is 1,900 PLN (data from November 2022). The cost of the SD NAUI diver course includes:

- full diving equipment for the duration of the course;
- a complete set of study materials;
- 4 theoretical lectures, 1.5 hours each, where the trainee should familiarise themselves with the safety rules;
- 5 swimming pool activities;
- 5 open water diving sessions.

5.2. Higher diving training

In the continuation of the certified diving career in the NAUI organisation, after obtaining the SD qualification, the next step is the ASD – Advanced Scuba Diver course.

The ASD training consists of one lecture lasting two hours. Six open water dives, with the first three dives being dedicated to the mandatory specialities: navigation, night or low visibility diving, and deep diving.

NOTE: Deep diving in the NAUI organisation means the immersion of a diver at a depth of water between 18 and 40 metres. The other three diving sessions depend on the specialisation chosen by the student.

To take the ASD course, the participant must be at least 15 years of age and hold a NAUI SD certificate or an equivalent certification from another diving organisation. There is also an option for younger students who, after turning 14, can join the ASD Junior course. The price of the ASD course starts from 1,200 PLN (as of November 2022).

Graduates of the ASD course receive a certificate verifying their competence in unsupervised diving in conditions similar to those of the course. The only thing that distinguishes the ASD course from the ASD Junior is the allowed diving depth. A graduate of the ASD Junior course cannot go deeper than 30 m. After reaching the age of 15, the course participant may apply for full ASD qualifications.

The highest degree in the field of recreational diving in the NAUI organisation is MSD – Master Scuba Diver.

The MSD training consists of 23 hours of theory and eight open water dives. The dive sessions are divided into three mandatory dives: Emergency and Rescue Procedures, Deep/Simulated Decompression Dive, Night or Low Visibility Dive, and five dives that the student has previously chosen to specialise in. The trainees must be at least 15 years of age and hold a current NAUI ASD certificate or NAUI-accepted equivalent to enrol in this course. After completing the training, the trainee receives a certificate verifying their competence to dive without supervision in conditions similar to the course. This means that the diving qualifications depend on the specialisations selected by the trainee during the NAUI MSD diving training. The price of the MSD NAUI course starts from 800 PLN (data from November 2022). Additional fees may result from the prices of the dives themselves.

5.3. Speciality dive courses

The NAUI organisation has a wide range of specialist courses that trainees can participate in to achieve the NAUI MSD degree and expand their competencies and interests:

- Dry Suit;
- Deep Diver;
- Night Diver;
- Underwater Environment Diver;
- Nitrox Diver;
- Wreck Diver.

6. CONCLUSIONS

A tabular summary of the main recreational diving grades according to the analysed institutions is presented in the following Table 2. By analysing the data contained in the table, it can be seen that there is a lower age limit for the basic courses organised by the SSI, PADI and NAUI organisations. The CMAS confederation offers the most theoretical classes and diving; instead of pool classes, they organise more open water classes. On the other hand, obtaining a basic degree in the SSI, NAUI and PADI organisations entitles the graduates to dive at smaller depths. The basic course organised by CMAS is the most expensive.

Table 2. Tabular summary of the main recreational diving grades according to CMAS, SSI, NAUI and PADI

| Certificate/ Organisation | CMAS | SSI | NAUI | PADI |
|--------------------------------------|---|--|--|--|
| Basic | One Star Diver | SSI OWD | NAUI SD | PADI OWD |
| Minimum age: | 14 years | 10 years (Junior) 15 years | 10 years (Junior) 15 years | 10 years (Junior) 15 years |
| Course: | 13 hours of theoretical lectures 20 hours of open water sessions 9 open water dives | 6 hours of theoretical lectures 6 pool sessions 4 open water dives | 4 theoretical lectures (4x1.5h) 5 pool sessions 5 open water dives | 5 hours of theoretical lectures 5 pool sessions 4 open water dives |
| Permissions: | 20 metres | 12 metres (Junior) 18 metres | 12 metres (Junior) 18 metres | 12 metres (Junior) 18 metres |
| Approximate price: | 2,290 PLN | 2,000 PLN | 1,900 PLN | 1,950 PLN |
| Advanced | Two Star Diver | SSI Advanced Adventurer | NAUI ASD | PADI AOWD |
| Minimum age: | 16 years | 10 years (Junior) 15 years | 14 years (Junior) 15 years | 12 years (Junior) 15 years |
| Course: | 10 open water dives | 5 hours of theoretical lectures 5 open water dives | 6 open water dives 1 theoretical lecture (2h) | 5 open water dives |
| Permissions: | 40 metres | 21 metres (Junior) 30 metres | 30 metres (Junior) 40 metres | 21 metres (Junior) 30 metres |
| Approximate price: | 2,490 PLN | 1,000 PLN | 1,200 PLN | 1,400 PLN |
| Higher | Three Star Diver | Master Diver | NAUI MSD | PADI MSD |
| Minimum age: | 18 years | Recognition degree | 15 years | Recognition degree |
| Course: | 19 hours of theoretical lectures 35 hours of open water sessions | | 23 hours of theoretical lectures 8 open water dives | |

cont. Table 2

| | | | | |
|--------------------|--|--|---|--|
| | 10 open water dives | | | |
| Permissions: | 50 metres Organising and conducting diving trips | | Depend on the specialities chosen during the course | |
| Approximate price: | 2,890 PLN | | 800 PLN + diving fee | |

Source: own study.

An advanced diving degree can be obtained at an earlier age by taking an SSI course. The CMAS organisation sets the highest age requirements for trainees as well as regarding the certificates they hold. CMAS offers the most open water dives. At the same time, it entitles graduates to perform deeper dives, just like the NAUI association for people aged 15 and over. The CMAS organisation offers the most expensive advanced course.

The SSI and PADI Scuba Diving School Higher degree is a recognised degree that is earned through experience – taking part in recreational diving and obtaining specialist certifications. In the CMAS diving confederation and NAUI, a separate course must be taken to earn a higher degree.

The CMAS organisation places the highest demands on its trainees in every aspect, while also offering the largest number of theoretical and practical sessions. It can be said that, thanks to this, CMAS-certified students are best prepared for diving in terms of safety and practical skills. This prevents more diving accidents. As members of the Student Special Interest Group of Underwater Research ‘Sea Quest’, we want to take part in the training of the CMAS Federation due to the well-developed training facilities in Poland and the wide development opportunities it offers.

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The Student Special Interest Group of Underwater Research ‘SeaQuest’ would like to continue their research in the project No. SKN/SP/535575/2022 called MUDS Base – the Mobile Underwater Diving Support Base, which was submitted as part of

a scientific competition organised by the Ministry of Science and Higher Education in October 2021 as a new initiative: 'Student Circles Create Innovations'. The members of 'SeaQuest' hope that their new project will gain extra financial support in this initiative, which will enable them to continue their research work on their new mobile diving base project with a flexible diving bell called Batychron. As a result of the planned research work in 2023, 'SeaQuest' would like to create a mobile MUDS Base device, which will be widely used in hydrotechnics for underwater transport and securing exploratory and tourist dives while maintaining the safety of human life.

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