



Regional Coordination Group
North Atlantic
North Sea & Eastern Arctic



Regional Coordination Group
Baltic

DCF Regional Coordination Group North Atlantic, North Sea, and Eastern Arctic (RCG NANSEA) + Baltic (RCG Baltic)

- Laboratory Stomach Analysis Manual -

Step-by-Step - Laboratory Stomach Analysis Manual

A - Sample Treatment

Sample types:

- a) Deep frozen stomach
- b) Deep frozen whole fish

Defrost only small numbers of samples because all defrosted samples have to be analysed fast and must not be frozen again!

B - Sample information

Variable names and table sections correspond to protocol below called “DCF Stomach Analysis Protocol” (Table I).

- Every predator fish gets its own Stomach Analysis Record
-> Record No: 1 of 1
- If there is a need for a second Stomach Analysis Record, due to high numbers of different prey types:
-> Record No: 2 of 2
- Name of the analysing person
-> Analysed by: Mats Sundin
- Date of first analysis
-> e.g. Date: 12.02.2022
- Transfer the Sample Card to the Stomach Analysis Record (cross-check with the sampling information from the Station Logs, if available)

DCF Stomach Analysis			Date :	Analysed by :				Reocrd No:	
Sample information	Vessel	Cruise-No.	Survey	Sampling Date	Station #	Haul #	Gear	Fish	Stomach

- Vessel
-> G.O. SARS, etc.
- Cruise-No.
-> Cruise number, e.g. 45 or 22/06
- Survey
-> use ICES DATRAS acronym (+ quarter if appropriate), e.g. NS-IBTS Q3
- Sampling Date
-> ddmmyyy

- Station #
-> Station number, e.g. 256
- Haul #
-> Haul number, e.g. 4
- Gear
-> e.g. GOV, Kabeljauhopper, etc.
- Fish
-> tick if the sample is the entire fish
- Stomach
-> tick if the sample is only the stomach

C - Predator information

When the sample type is only the stomach, transfer the length and weight values from the onboard sampling protocol.

Predator information	Species								
	Fish ID	Total length (cm)	Predator weight (g)	Gutted weight (g)					

- Species
-> Predator species in LATIN, e.g. *Gadus morhua*
- Fish ID
-> use national or survey-specific numbering.
- Total length (cm below). NOTE: if other length measurement is conducted, please indicate.
-> Total length of predator, accuracy to the nearest cm below.
- Predator weight (g)
-> Total wet weight of predator, accuracy: 0.1 g
- Gutted weight (g)
-> Gutted weight of predator, accuracy: 0.1 g, Gutted = remove all organs in the abdominal cavity

D - Stomach information

Stomach information	Full stomach weight (g)	Empty stomach weight (g)	Stomach content weight (g)	Stomach Full / Empty

- Full stomach weight (g)
-> First remove all adherent water with a paper tissue, then weigh the stomach. Preferred weight accuracy: 0.001 g
- Empty stomach weight (g)
-> Remove stomach content with tweezers and/or the use of water, then weigh the stomach wall. Preferred weight accuracy: 0.001 g
- Stomach content weight (g)
-> Calculate difference between full and empty stomach (this should preferably be done at a later stage at the computer)
- **Be aware: It is also possible to skip the last three work steps and estimate the total stomach content by adding up the weights of all different prey species or types in the stomach!**
- Stomach Full / Empty
-> Code to categorise Full / Empty Stomachs

0 = empty stomach; there is no prey in the stomach, small amounts of mucus ($\leq 0,2\%$ body weight, BW) as well as non-dietary items, e.g. nematodes, tapeworms, sand or plastic particles do not count as prey items.

1 = filled (non-empty) stomach; there is at least a single prey item (or a substantial amount of mucus, that means $> 0,2\%$ BW) in the stomach.

2 = regurgitated according to gall bladder state

E - Prey information

Prey information		Stomach ID	Nematodes:					
Species / Taxon	Digestion stage	Prey Numbers	Prey Size (mm)	Measurement type	Prey weight (g)	Comments		

➤ Stomach ID (often identical to Fish ID)

➤ Nematodes

-> Number of nematodes in the stomach

Semi quantitative scale:

- 0 = 0 nematodes
- + = up to 10
- ++ = up to 50
- +++ = over 50

➤ Species / Taxon

-> Fish prey (and relevant invertebrates, Table 2) should be identified to the most detailed level possible (species). Invertebrates are identified to at least larger taxon (mandatory) or if feasible to more detailed (e.g. genus or species) taxon (optional) (see Table Prey Codes in Table 2). All prey species are recorded using WoRMS' AphiaID codes (<http://www.marinespecies.org/aphia.php>).

➤ Digestion Stage (1 – 3 for fish and invertebrates; 0 for fish – net feeding)

-> 1 = intact prey (skin, fins, flesh, legs is/are complete)

2 = prey in more advanced stages of digestion, some appendages might be detached

3 = skeletal material or remains (fish: no flesh, only bones, otoliths; invertebrates: shells, siphon, bristles, legs, cheliped, tails, heads, eyes, etc.)

➤ Prey Numbers

-> Count all fish species and invertebrates (Table 2). Number of fish prey or relevant invertebrate prey organisms (Table 2) with identical digestion stages and sizes!

➤ Prey Size (mm)

-> Measure size only if prey organism is complete (different length measurement types in table below).

- Fish: Total length, TL, below in mm (or Standard length if TL is not possible)
- Crab: Carapace width in mm
- Shrimp: Distance between bases of rostrum and uropods in mm
- Isopod (*Saduria entomon*): Total length (excl. antennae); pleotelson for partially digested individuals

➤ Measurement type

-> Indicate what was measured, e.g. Total length (TL), Standard length (SL), etc.

Prey group	Length measured	Code
Vertebrata	Total length from snout to end of tail fin	TL
	Standard length from snout to basis of tail fin	SL
Crustacea	Total length of small crustaceans like mysids, krill and amphipods and intact <i>Nephrops</i> , shrimps, prawns and <i>Saduria entomon</i> .	TL
	Length from bases of eye stalks or rostrum to uropods or carapace length in the case of advanced digestion stage of nephrops, shrimps and prawns.	CL
	Carapace width of crabs	CW
	Pleotelson length of <i>Saduria entomon</i> in the case of advanced digestion stage.	PL
Cephalopoda	Mantle length	ML
	Beak length in the case of advanced digestion stage.	BL
Others	Total length of complete specimens	TL

- Prey weight (g)
 - > Digestion stage I
 - Individual mass of prey items; Preferred accuracy: 0.001g
 - > Digestion stages (2+3)
 - Weight of group of the same taxon within the same digestion stage; accuracy: Preferred 0.001g

- Data are recorded in the ICES exchange format (Table 3).

Table 2. Prey codes (Aphia ID)

Taxonomic level	Prey group	Code
Phylum	Ctenophora	1248
Phylum	Cnidaria	1267
Phylum	Annelida	882
Species	Aphrodita aculeata (sea mouse)	231869
Phylum	Mollusca	51
Class	Gastropoda	101
Species	Buccinum undatum (common whelk)	138878
Class	Bivalvia	105
Species	Aequipecten opercularis (queen scallop)	140687
Species	Pecten maximus (king scallop)	140712
Class	Cephalopoda	11707
Phylum	Echinodermata	1806
Phylum	Arthropoda	1065
Subphylum	Crustacea	1066
Order	Mysida	149668
Order	Euphausiacea	1128
Order	Isopoda	1131
Species	Saduria entomon	293511
Order	Amphipoda	1135
Order	Decapoda	1130
Infraorder	Caridea	106674
Family	Crangonidae	106782
Species	<i>Crangon crangon</i> (brown shrimp)	107552
Family	Palaemonidae	106788
Species	Palaemon adspersus (Baltic prawn)	107613
Species	Pandalus borealis (northern prawn)	107649
Infraorder	Astacidea	106672
Species	Nephrops norvegicus (Norway lobster)	107254
Infraorder	Brachyura	106673
Species	Cancer pagurus (edible crab)	107276
Infraorder	Anomura	106671
Species	Pagurus bernhardus (hermit crab)	107232
	Other invertebrates	9990
	Plastic	9991
	Litter other than plastic	9992

Table 3. ICES data exchange format for stomach data (<https://www.ices.dk/data/data-portals/Pages/Stomach-content.aspx>). Note: The code lists in column 4 are available on the ICES-webpage.

FI – File_information

Start	FieldCode	Datatype	Code List	Mandatory	Header	Description
1	RecordType	char(2)		yes	Record type	
2	Country	char(2)	ISO_3166	yes	Country code based on the ISO 3166 standard -	Country of the organisation responsible for data collection and storage
3	Reporting_organisation	char(6)	EDMO	yes	EDMO code of the reporting organisation	
4	CruiseID	char(20)		yes	CruiseID	- Unique cruise ID in the format: Country + EDMO code + Ship code+ year (DA219526D42021)

HH – Haul Information

Start	FieldCode	Datatype	Code List	Mandatory	Header	Description / Additional Information
1	RecordType	char(2)		yes	Record type	
2	Ship	char(4)	SHIPC	yes	SeaDataNet ship code	
3	Gear	char(15)	SMTYP	yes	Sampling gear used	
4	HaulNo	int(6)		yes	Haul number	- sequential numbering by cruise
5	StationNumber	char(10)		yes	Station number by national coding system	
6	Year	char(4)		yes	Year of the cruise	
7	Month	int(2)		yes	Month of the cruise	
8	Day	int(2)		yes	Day of the haul	
9	Time	char(4)		yes	Shooting time (UTC)	(HHMM), 4 digits. E.g. 10:15=1015
10	ShootLat	decimal4(8)		yes	Shoot of gear latitude	
11	ShootLong	decimal4(9)		yes	Shoot of gear longitude	
12	HaulLat	decimal4(8)		no	Haul latitude	
13	HaulLong	decimal4(9)		no	Haul longitude	
14	ICESrectangle	char(4)	StatRec	no	ICES statistical rectangle of the sampling location	
15	Depth	int(4)		no	Average depth during trawling	

16	Survey	char(20)		no	Survey code (ICES survey codes) or project name	
17	ICESDatabase	char(1)	YesNoFields	no	Catch and biological data available in other ICES databases, e.g DATRAS or Acoustic -	Yes or No field
18	Notes	char(100)		no	Any additional information	

PI – Predator Information

Start	FieldCode	Datatype	Code List	Mandatory	Header	Description / Additional Information
1	RecordType	char(2)		yes	Record type	
2	Ship	char(4)	SHIPC	yes	SeaDataNet ship code	
3	Gear	char(15)	SMTYP	yes	Sampling gear used	
4	HaulNo	int(6)		yes	Haul number	- sequential numbering by cruise
5	StationNumber	char(10)		yes	Station number by national coding system	
6	Year	char(4)		yes	Year of the cruise	
7	Month	int(2)		yes	Month of the cruise	
8	Day	int(2)		yes	Day of the haul	
9	Time	char(4)		yes	Shooting time (UTC)	(HHMM), 4 digits. E.g. 10:15=1015
10	FishID	char(20)		yes	Unique fish identification number for predator	
11	AphiaIDPredator	int(10)		yes	WoRMS AphiaID Species reference code of predator	
12	IndWgt	float(5)		no	Weight of predator in grams	
13	Number	int(2)		no	Number of species taken for stomach analyses (pooled samples)	
14	MeasurementIncrement	float(2)		no	Measurement increment in cm	
15	Length	float(10)		no	Length of species	
16	AgeSource	char(10)	AGDET	yes	Age reading source material	
17	Age	int(2)		no	Age of predator	
18	Sex	char(1)	SEXCO	no	Sex of predator	
19	MaturityScale	char(6)	AC_MaturityScale	no	Maturity scale	

20	MaturityStage	char(4)	AC_MaturityCode	no	Maturity stage within chosen maturity scale	
21	PreservationMethod	char(8)		no	Storage/preservation method at the time of sampling -	Insert the storage/preservation method used according to ICES vocabulary METST/METFP.
22	Regurgitated	int(4)		no	Number of stomachs regurgitated	
23	StomachFullness	char(1)	StomachFullness	no	Stomach fullness scale	
24	FullStomWgt	float(6)		no	Weight of stomach with prey	
25	EmptyStomWgt	float(6)		no	Weight of stomach without prey	
26	StomachEmpty	int(6)		no	Number of empty stomachs in the sample	
27	GenSamp	char(1)	YesNoFields	no	Stomach content analysed using genetics - Yes or No	
28	Notes	char(100)		no	Any additional information	

PP – Prey Information

Start	FieldCode	Datatype	Code List	Mandatory	Header	Description / Additional Information
1	RecordType	char(2)		yes	Record type	
2	Ship	char(4)	SHIPC	yes	SeaDataNet ship code	
3	Gear	char(15)	SMTYP	yes	Sampling gear used	
4	HaulNo	int(6)		yes	Haul number	- sequential numbering by cruise
5	StationNumber	char(10)		yes	Station number by national coding system	
6	Year	char(4)		yes	Year of the cruise	
7	Month	int(2)		yes	Month of the cruise	
8	Day	int(2)		yes	Day of the haul	
9	Time	char(4)		yes	Shooting time (UTC)	(HHMM), 4 digits. E.g. 10:15=1015
10	FishID	char(20)		yes	Unique fish identification number for predator	

11	AphiaIDPredator	int(10)		yes	WoRMS AphiaID Species reference code of predator	
12	AphiaIDPrey	int(10)		no	WoRMS AphiaID Species reference code of prey	
13	IdentMet	char(10)		no	Prey species identification method -	Insert the identification method used according to ICES vocabulary METOA/SampleType.
14	DigestionStage	int(1)	DigestionStage	no	Stage of digestion of prey items	
15	GravMethod	char(5)	PARAM	no	Gravemetric method used	
16	SubFactor	decimal4(9)		no	Subsampling factor	- report 1 if the whole catch was analysed, or report a raising factor if only a part of the catch was analysed.
17	PreySequence	char(10)		yes	Unique prey sequence ID number	
18	Count	int(8)		no	Number of prey	
19	UnitWgt	char(6)	MUNIT	no	Unit of weight measurement	
20	Weight	float(8)		no	Weight, individual or grouped	
21	UnitLngt	char(6)	MUNIT	no	Unit of length measurement	
22	Length	float(10)		no	Length of species	
23	OtherItems	char(100)		no	Other items descriptor	
24	OtherCount	int(10)		no	Number of other items	
25	OtherWgt	float(6)		no	Weight of other items in grams	
26	AnalysingOrg	varchar(6)	EDMO	yes	EDMO code of the organisation in charge of analysing stomach samples	
27	Notes	char(100)		no	Any additional information	