

Table 1
Summary of studies reporting the occurrence of microplastics in shellfish and fish of commercial interest as food.

Species name	Levels of mp	Size range	Parts	Types of debris	Location	Source
Shellfish						
<i>Alectryonella plicatula</i>	10.78 ± 4.07 particles/individual	5–5000 µm	Soft tissue	Fibers, fragments, pellets	China From local fish market	Li et al. (2015)
<i>Amiantis umbonella</i>	6 particles/individual	10–5000 µm	Soft tissue	Fibers, fragments, pellets, film	Coastal water of The Persian Gulf, Iran, Asia	Naji et al. (2018)
<i>Amiantis purpuratus</i>	6 particles/individual	10–5000 µm	Soft tissue	Fibers, fragments, pellets, film	Coastal water of The Persian Gulf, Iran, Asia	Naji et al. (2018)
<i>Cerithidea cingulata</i>	12 particles/individual	10–5000 µm	Soft tissue	Fibers, fragments, pellets, film	Coastal water of The Persian Gulf, Iran, Asia	Naji et al. (2018)
<i>Crangon crangon</i>	0.68 particles/g individual	200–1000 µm	Whole shrimp and peeled shrimp (abdominal muscle tissue)	Fibers	Belgium	Devriese et al. (2015)
<i>Crassostrea gigas</i>	0.6 particles/g individual	> 500 µm	Entire tissue	Fibers	California, USA From local market	Rochman et al. (2015)
	0.47 particles/g individual	5–25 µm	Soft tissue	Not specified	Atlantic Ocean Market from Brittany, France	van Cauwenberghe and Janssen (2014)
<i>Cyclina sinensis</i>	4.82 ± 2.17 particles/individual	5–5000 µm	Soft tissue	Fibers, fragments, pellets	China From local fish market	Li et al. (2015)
<i>Eriocheir sinensis</i>	13% ind. with MP	Not specified	Stomachs	Fragments, filaments	Baltic coastal	Wójcik-Fudalewska et al. (2016)
<i>Meretrix lusoria</i>	9.22 particles/individual	5–5000 µm	Soft tissue	Fibers, fragments, pellets	China From local fish market	Li et al. (2015)
<i>Mytilus edulis</i>	0.36 ± 0.07 particles/g	5–25 µm	Soft tissue	Not specified	North Sea	Van Cauwenberghe and Janssen (2014)
<i>Mytilus galloprovincialis</i>	4.33 ± 2.62 particles/individual	5–5000 µm	Soft tissue	Fibers, fragments, pellets	China From local fish market	Li et al. (2015)
	6.2–7.2 particle/g	760–6000 µm	Valves, hepatopancreas and gills	Filaments	Italy From maricultured and natural stocks	Renzi et al. (2018)
<i>Mytilus spp.</i>	3.2 ± 0.52 particles/individual	200 – > 2000 µm	Soft tissue	Fibers	Scottish coast	Catarino et al. (2018)
<i>Modiolus modiolus</i>	3.5 ± 1.29 particles/individual	200 – > 2000 µm	Soft tissue	Fibers	Scottish coast	Catarino et al. (2018)
<i>Nephrops norvegicus</i>	83% ind. with MP	Not specified	Stomach	Filaments	Clyde, UK	Murray and Cowie (2011)
<i>Panaeus semisulcatus</i>	7.8 particles/individual	< 100 – > 1000 µm	Muscle, skin	Fibers	Musa estuary, Persian Gulf	Abassi et al. (2018)
<i>Patinopecten yessoensis</i>	57.17 ± 17.34 particles/individual	5–5000 µm	Soft tissue	Fibers, fragments, pellets	China From local fish market	Li et al. (2015)
<i>Perna perna</i>	26.7% ind. with MP	Not specified	Digestive tract and entire tissue	Fibers	Santos Estuary, Brazil	Santana et al. (2016)
<i>Pinctada radiata</i>	11 particles/individual	10–5000 µm	Soft tissue	Fibers, fragments, pellets, film	Coastal water of The Persian Gulf, Iran, Asia	Naji et al. (2018)
<i>Ruditapes philippinarum</i>	5.72 ± 2.86 particles/individual	5–5000 µm	Soft tissue	Fibers, fragments, pellets	China From local fish market	Li et al. (2015)
<i>Scapharca subcrenata</i>	45 ± 14.98 particles/individual	5–5000 µm	Soft tissue	Fibers, fragments, pellets	China From local fish market	Li et al. (2015)
<i>Sinonovacula constricta</i>	14.33 ± 2.21 particles/individual	5–5000 µm	Soft tissue	Fibers, fragments	China From local fish market	Li et al. (2015)
<i>Tegillarca granosa</i>	5.33 ± 2.21 particles/individual	5–5000 µm	Soft tissue	Fibers, fragments	China From local fish market	Li et al. (2015)
<i>Thais mutabilis</i>	3 particles/individual	10–5000 µm	Soft tissue	Fibers, fragments, pellets, film	Coastal water of The Persian Gulf, Iran, Asia	Naji et al. (2018)
Fish						
<i>Acanthurus gahhm</i>	10; 100%	2700 µm (mean)	Gastrointestinal tract	Fibers, film, fishing thread	Saudi Arabian Red Sea coast	Baalkhuyur et al. (2018)

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Table 1 (continued)

Species name	Levels of mp	Size range	Parts	Types of debris	Location	Source
<i>Alepes djedaba</i>	20; 100% (8.00 ± 1.22 item/10 g fish muscle)	< 100–5000 µm	Muscle	Fibers, fragments, pellets	Northeast of Persian Gulf	Akhbarizadeh et al. (2018)
<i>Argyrosomus regius</i>	5; 60%	217–4810 µm	Gastrointestinal tract	Fibers, fragments	Portuguese Coast *From local market	Neves et al. (2015)
	51; 75%	> 9.07 µm	Gastrointestinal tract	Fibers, hard plastic, nylon	Mediterranean Sea	Güven et al. (2017)
<i>Atherinopsis californiensis</i>	7; 29%	> 500 µm	Gastrointestinal tract	Fibers, fragments	California, USA From local market	Rochman et al. (2015)
<i>Brama brama</i>	3; 33%	217–4810 µm	Gastrointestinal tract	Fibers	Portuguese Coast *From local market	Neves et al. (2015)
<i>Cetengraulis mysticetus</i>	30; 3.3%	≤ 1100 µm	Gut	Fragment	Southeast Pacific Ocean	Ory et al. (2018)
<i>Clupea harengus</i> ****	566; 2%	> 1000 µm	Gastrointestinal tract	Fibers, fragments	North Sea	Foekema et al. (2013)
	299; 21%	100 – > 5000 µm	Gastrointestinal tract	Fibers, fragments	Baltic Sea	Beer et al. (2018)
<i>Cynoglossus abbreviatus</i>	11; 12 (mean/individual)	< 100 – > 1000 µm	Muscle, gut, gills, liver, skin	Fibers, fragments	Musa estuary, Persian Gulf	Abassi et al. (2018)
<i>Cynoscion acoupa</i>	552; 51%	< 5000 µm	Gut	Filaments, hard microplastics	Goiana estuary, Brazil	Ferreira et al. (2018)
<i>Decapterus macrosoma</i> ****	17; 29%	> 500 µm	Gastrointestinal tract	Fragments, styrofoam	Eastern Indonesia From local market	Rochman et al. (2015)
<i>Decapterus muroadsi</i> ****	20; 80%	5000 µm	Gut	Fragments	South Pacific	Ory et al. (2017)
<i>Dentex macropthalmus</i>	1; 100%	217–4810 µm	Gastrointestinal tract	Fibers	Portuguese Coast *From local market	Neves et al. (2015)
<i>Dicentrarchus labrax</i>	40; 23%	≤ 1000–5000 µm	Gastrointestinal tract	Fibers, fragments	Mondego estuary, Portugal	Bessa et al. (2018)
<i>Diplodus vulgaris</i>	40; 73%	≤ 1000–5000 µm	Gastrointestinal tract	Fibers, fragments	Mondego estuary, Portugal	Bessa et al. (2018)
<i>Engraulis encrasicolus</i>	10; 80%	124–438 µm	Liver	Not specified	Mediterranean Sea	Collard et al. (2017)
	105; 15.24%	Not specified	Gastrointestinal tract	Fibers, fragments	Mediterranean Sea	Compa et al. (2018)
<i>Engraulis japonicus</i> ****	64; 77%	10–500 µm	Gastrointestinal tract	Fragments, bead, filament, foam	Tokyo Bay	Tanaka and Takada (2016)
<i>Engraulis mordax</i>	10; 30%	> 500 µm	Gastrointestinal tract	Fiber, film, monofilament	California, USA From local market	Rochman et al. (2015)
<i>Epinephelus areolatus</i>	5; 20%	1800 µm (mean)	Gastrointestinal tract	Fibers, film, fishing thread	Saudi Arabian Red Sea coast	Baalkhuyur et al. (2018)
<i>Epinephelus chlorostigma</i>	3; 33.33%	1900 µm (mean)	Gastrointestinal tract	Fibers, film, fishing thread	Saudi Arabian Red Sea coast	Baalkhuyur et al. (2018)
<i>Epinephelus coioides</i>	20; 100% (7.75 ± 2.16 item/10 g fish muscle)	< 100–5000 µm	Muscle	Fibers, fragments, pellets	Northeast of Persian Gulf	Akhbarizadeh et al. (2018)
<i>Gadus morhua</i> ****	80; 13%	> 1000 µm	Gastrointestinal tract	Fibers, fragments	North Sea	Foekema et al. (2013)
	74; 1.4%	< 5000 µm	Gastrointestinal tract	Fibers, fragments, film	Baltic Sea	Rummel et al. (2016)
	205; 2.4%	2800–4200 µm	Gastrointestinal tract	Fragments	Coast of Canada	Liboiron et al. (2016)
	302; 18.8%	< 5000	Stomach	Fibers, fragments, granule, film	Norwegian coast	Brate et al. (2016)
<i>Lethrinus microdon</i>	10; 20%	1480 µm (mean)	Gastrointestinal tract	Fibers, film, fishing thread	Saudi Arabian Red Sea coast	Baalkhuyur et al. (2018)
<i>Lipocheilus carnolabrum</i>	7; 28.57%	1870 µm (mean)	Gastrointestinal tract	Fibers, film, fishing thread	Saudi Arabian Red Sea coast	Baalkhuyur et al. (2018)
<i>Lutjanus kasmira</i>	10; 16.67%	2160 µm (mean)	Gastrointestinal tract	Fibers, film, fishing thread	Saudi Arabian Red Sea coast	Baalkhuyur et al. (2018)
<i>Merlangius merlangus</i>	50; 32%	1000–2000 µm	Gastrointestinal tract	Fibers, fragments, beads	English Channel	Lusher et al. (2013)

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Table 1 (continued)

Species name	Levels of mp	Size range	Parts	Types of debris	Location	Source
<i>Merluccius merluccius</i>	12; 29%	217–4810 µm	Gastrointestinal tract	Fibers	Portuguese Coast	Neves et al. (2015)
	3; 100%	10–5000 µm	Gastrointestinal tract	Fragments, line, film, pellet	Adriatic Sea	Avio et al. (2015)
	12; 16.7%	380–3100 µm	Stomach	Fragments, fibers, film, spheres	Spanish Atlantic	Bellas et al. (2016)
<i>Micromesistius poutassou</i> ****	27; 51.9%	1000–2000 µm	Gastrointestinal tract	Fibers, fragments, beads	English Channel	Lusher et al. (2013)
<i>Morone saxatilis</i>	7; 29%	> 500 µm	Gastrointestinal tract	Fibers, film, foam	California, USA From local market	Rochman et al. (2015)
<i>Mugil cephalus</i>	30; 60% (wild)	< 2000 – > 5000 µm	Gastrointestinal tract	Fibers, fragments, sheet	Hong Kong Coast	Cheung et al. (2018)
	30; 16.7% (captive)	< 2000–5000 µm	Gastrointestinal tract	Fibers	Hong Kong From fish farms	Cheung et al. (2018)
<i>Mullus barbatus</i>	11; 64%	10–5000 µm	Gastrointestinal tract	Fragments, line, film, pellet	Adriatic Sea	Avio et al. (2015)
	207; 66%	> 9.07 µm	Stomach and intestine	Fibers, hard plastic, nylon	Mediterranean Sea	Güven et al. (2017)
	128; 18.8%	380–3100 µm	Stomach	Fragments, fibers, film	Mediterranean coast	Bellas et al. (2016)
<i>Mullus surmuletus</i>	4; 100%	217–4810 µm	Gastrointestinal tract	Fibers	Portuguese Coast	Neves et al. (2015)
	51; 35 and 49%	> 9.07 µm	Gastrointestinal tract	Fibers, hard plastic, nylon	Mediterranean Sea	Güven et al. (2017)
<i>Odontesthes regia</i>	9; 11.1%	Not specified	Gut	Fragments	Southeast Pacific Ocean	Ory et al. (2018)
<i>Oncorhynchus tshawytscha</i>	4; 25%	> 500 µm	Gastrointestinal tract	Fibers	California, USA From local market	Rochman et al. (2015)
<i>Opisthonema libertate</i>	40; 5%	≤ 3700 µm	Gut	Thread	Southeast Pacific Ocean	Ory et al. (2018)
<i>Parascolopsis eriomma</i>	5; 60%	1380 µm (mean)	Gastrointestinal tract	Fibers, film, fishing thread	Saudi Arabian Red Sea coast	Baalkhuyur et al. (2018)
<i>Platycephalus indicus</i>	16; 100% (18.5 ± 4.55 item/10 g fish muscle)	< 100–5000 µm	Muscle	Fibers, fragments, pellets	Northeast of Persian Gulf	Akhbarizadeh et al. (2018)
	12; 21.8 (mean/individual)	< 100 – > 1000 µm	Muscle, gut, gills, liver, skin	Fibers	Musa estuary, Persian Gulf	Abassi et al. (2018)
<i>Platichthys flesus</i>	40; 13%	≤ 1000–5000 µm	Gastrointestinal tract	Fibers, fragments	Mondego estuary, Portugal	Bessa et al. (2018)
<i>Plectorhinchus gaterinus</i>	6; 33.33%	3310 µm (mean)	Gastrointestinal tract	Fibers, film, fishing thread	Saudi Arabian Red Sea coast	Baalkhuyur et al. (2018)
<i>Pristipomoides multidens</i>	10; 20%	3800 µm (mean)	Gastrointestinal tract	Fibers, film, fishing thread	Saudi Arabian Red Sea coast	Baalkhuyur et al. (2018)
<i>Rastrelliger kanagurta</i>	10; 56%	> 500 µm	Gastrointestinal tract	Fragments, film, monofilament	Eastern Indonesia From local market	Rochman et al. (2015)
<i>Rhizoprionodonalandii</i>	6; 33%	1000–5000 µm	Stomach	Pellets	Northeastern Brazil	Miranda and Carvalho-Souza (2016)
<i>Sardinella longiceps</i> ****	10; 60%	500–3000 µm	Gut	Fragments	Indian Coast	Sulochanan et al. (2014)
<i>Sardina pilchardus</i> ****	99; 19%	10–5000 µm	Gastrointestinal tract	Fragments, line, film, pellet	Adriatic Sea	Avio et al. (2015a, 2015b)
	7; 57%	> 9.07 µm	Gastrointestinal tract	Fibers, hard plastic, nylon	Mediterranean Sea	Güven et al. (2017)
	2; 100%	124–438 µm	Liver	Not specified	Mediterranean Sea	Collard et al. (2017)
<i>Saurida tumbil</i>	105; 14.28%	Not specified	Gastrointestinal tract	Fibers, fragments	Mediterranean Sea	Compa et al. (2018)
	4; 13.5 (mean/individual)	< 100 – > 1000 µm	Muscle, gut, gills, liver, skin	Fibers, fragments	Musa estuary, Persian Gulf	Abassi et al. (2018)
<i>Sillago sihama</i>	17; 14.1 (mean/individual)	< 100 – > 1000 µm	Muscle, gut, gills, liver, skin	Fibers, fragments	Musa estuary, Persian Gulf	Abassi et al. (2018)

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Table 1 (continued)

Species name	Levels of mp	Size range	Parts	Types of debris	Location	Source
<i>Scyliorhinus canicula</i>	20; 5%	1500 µm	Stomach	Micro-bead	North Sea	Smith (2018)
	72; 15.3%	380–3100 µm	Stomach	Fragments, fibers, film	Mediterranean coasts	Bellas et al. (2016)
<i>Scomberomorus cavalla</i> ****	8; 62.5%	1000–5000 µm	Stomach	Pellets	Northeastern Brazil	Miranda and Carvalho-Souza (2016)
<i>Scomber japonicus</i> ****	7; 71%	> 9.07 µm	Gastrointestinal tract	Fibers, hard plastic, nylon	Mediterranean Sea	Güven et al. (2017)
<i>Scomber scombrus</i> ****	35; 31%	217–4810 µm	Gastrointestinal tract	Fragments, fibers	Portuguese Coast	Neves et al. (2015)
	30; 3.3%	≤2100 µm	Gut	Fragment	Southeast Pacific Ocean	Ory et al. (2018)
	13; 31%	217–4810 µm	Gastrointestinal tract	Fragments, fibers	Portuguese Coast	Neves et al. (2015)
	13; 30.8%	< 5000 µm	Gastrointestinal tract	Fibers, fragments, film	Baltic Sea	Rummel et al. (2016)
<i>Siganus canaliculatus</i>	3; 29%	> 500 µm	gastrointestinal tract	Monofilament	Eastern Indonesia From local market	Rochman et al. (2015)
<i>Solea solea</i>	533; 95%	< 100–500 µm	Gastrointestinal tract	Fibers, fragments	Adriatic Sea	Pellini et al. (2018)
<i>Sparus aurata</i>	110; 44%	> 9.07 µm	Gastrointestinal tract	Fibers, hard plastic, nylon	Mediterranean Sea	Güven et al. (2017)
<i>Spratelloides gracilis</i>	4; 40%	> 500 µm	Gastrointestinal tract	Fragments	Eastern Indonesia From local market	Rochman et al. (2015)
<i>Sprattus sprattus</i> ****	515; 18.8%	100 – > 5000 µm	Gastrointestinal tract	Fibers, fragments	Baltic Sea	Beer et al. (2018)
<i>Sphyræna jello</i>	15; 100% (5.66 ± 1.69 item/10 g fish muscle)	< 100–5000 µm	Muscle	Fibers, fragments	Northeast of Persian Gulf	Akhbarizadeh et al. (2018)
<i>Thalassoma rueppellii</i>	12; 8.33%	1930 µm (mean)	Gastrointestinal tract	Fibers, film, fishing thread	Saudi Arabian Red Sea coast	Baalkhuyur et al. (2018)
<i>Thunnus alalunga</i>	131; 12.9%	< 5000 µm	Stomach	Fragments	Mediterranean Sea	Romeo et al. (2015)
<i>Thunnus thynnus</i>	34; 34.4%	< 5000 µm	Stomach	Fragments	Mediterranean Sea	Romeo et al. (2015)
<i>Trachurus trachurus</i>	56; 28.6%	1000–2000 µm	Gastrointestinal tract	Fibers, fragments, beads	English Channel	Lusher et al. (2013)
<i>Trigla lyra</i>	31; 19%	217–4810 µm	Gastrointestinal tract	Fragments, fibers	Portuguese Coast	Neves et al. (2015)
<i>Xiphias gladius</i>	56; 12.5%	< 5000 µm	Stomach	Fragments	Mediterranean Sea	Romeo et al. (2015)
<i>Zeus faber</i>	1; 100%	217–4810 µm	Gastrointestinal tract	Fibers	Portuguese Coast	Neves et al. (2015)
	42; 47.6%	1000–2000 µm	Gastrointestinal tract	Fibers, fragments, beads	English Channel	Lusher et al. (2013)
<i>Clupea harengus</i>	400; 0.25%	> 20 µm	Gastrointestinal tract	Spherical particles	North Sea	Hermesen et al. (2017)
<i>Limanda limanda</i>	Two plastic particles were found in only 1 (<i>Sprattus sprattus</i>) out of 400 individuals					
<i>Merlangius merlangus</i>						
<i>Sprattus sprattus</i>						
<i>Chelon subviridis</i>	30; Between 0 and 3 pigments and MP particles were isolated from each individual fish.	1–1000 µm	Eviscerated flesh (whole fish excluding the viscera and gills) and excised organs (viscera and gills)	Fragments, filaments, films	Malaysia *From local market	Karami et al. (2017a)
<i>Johnius belangerii</i>						
<i>Rastrelliger kanagaruta</i>						
<i>Stolephorus waitei</i>						

[****Indicates that this species is included in the list of the most commonly caught marine species worldwide according to FAO, 2016].